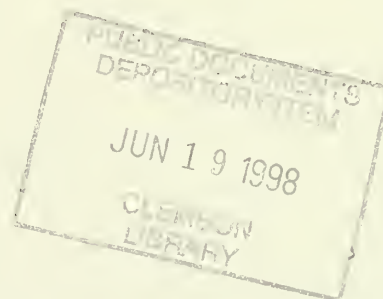


ARCHEOLOGY AT THE FORT LARAMIE QUARTERMASTER DUMP AREA, 1994-1996



edited by

Danny N. Walker



No. 13
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**edited by
Danny N. Walker**

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National Park Service
Rocky Mountain Region
Division of Cultural Resources
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1998

Mission Statement: As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration. NPS-D-74

FOREWORD

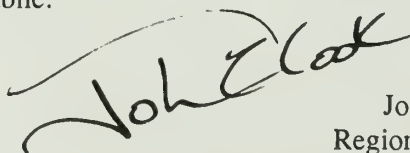
The story of the Fort Laramie National Historic Site represents the western movement of the United States. Its strategic Oregon Trail location as a 1830s and 1840s trading post between the Americans and Native American tribes made it an ideal setting for the establishment of a military post. From the start of the military occupation in the 1849 to the abandonment of the post in 1890, Fort Laramie was at the crossroads of western expansion of the United States.

Even after the passage of the western frontier into the pages of history books, the fort has stood at the front of preservation activities. The old post was one of the first National Parks created after the passage of the Historic Sites Act of 1935. In 1993, during a National Park Service Remote Sensing/Geophysical Techniques for Cultural Resource Management workshop, serious deterioration of the archeological resources was identified during an innovative low altitude large scale reconnaissance flight along the Laramie River. In the aerial photographs taken from a radio controlled model airplane, the adverse impacts of Laramie River flood control structures on the archeological deposits associated with the Quartermasters Dump area were detected. With the assistance of workshop participants, the erosional problem associated with the flood control structures was identified and an archeological data recovery determined to be the most appropriate approach to protection of the cultural features and materials. Since that

time the park has completed mitigation to protect the site and prevent future erosion.

Keeping with the role of Fort Laramie National Historic Site as a leader in western history and historic preservation, the subsequent archeological investigations utilized innovative techniques and equipment at the vanguard of scientific investigations. In a cooperative venture among the National Park Service, the Wyoming State Archaeologist's Office, and the University of Wyoming, geophysical techniques (i.e., soil resistance and magnetic surveys) were combined with historical research of documents, maps, and photographs as well as auger testing and standard archeological excavation methods. In addition, a geographic information systems (GIS) study was also conducted using the existing military maps of Fort Laramie in order to identify potential locations of military structures (i.e., the adobe corral) within the project area.

The results of the project documented in this report far exceed the demands and conditions of compliance-related archeological investigations. The study incorporates a variety of innovative techniques with solid archeological research to provide insight into the daily activities associated with the late nineteenth century military garrison. I take great pleasure in making this archeological study of the Fort Laramie Quartermasters Dump available to the scientific community and to the public.



John E. Cook
Regional Director
Intermountain Region

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The 1994 University of Wyoming field crew consisted of Anne K. Armstrong, Cheryl Babb, Margorie Brooks, Jason LaBelle, Jennifer Minor, Laura Niven, Karen Rogers, Randy Shaw, Williams S. Woods, and Dana Wahlquist. Dr. Mark Miller, Wyoming State Archaeologist, helped throughout the field and lab work between 1994 and 1996. The laboratory crew (1994-1996) consisted of Anne K. Armstrong, Christopher Hall, Elise Howard, Jeff Keahey, Peter Neidhardt, Mark Nelson, Laura Niven, Russell Richards, Karen Rogers, Lori Terrill, and Kristi Williams.

1994 volunteers included Carolyn Buff, Cher Burgess, Austin Butcher, Byrla (Kit) Carson, Jessica Clarke, Richard Coates, Inge Coates, Julie Coleman-Fike, Dan Corbin, Jody Cousins, Austin Deines, Smokey Deines, Larry Deines, Sherry Deines, Linda De Tavernier, Richard Fike, John Guy, Judith Hurst, Ann Johnson, Chris Johnson, Nora Kingrey, Mary Koons, Mary Ann Koons, Ken Kvamme, Danielle Laird, Joshua Miller, Darrell Mills, Raymond Morand, Beverly Nankivell, Renee Naylor, Dorothy Page, Nick Palmer, William Payne, James Powers, Edward Remeika, Christine Renfro, Brian Renfro, Robert Reynolds, Betty Rickman, Whit Rux, Maura Rux, Megin Rux, Janice Saysette, Beverly Spungin, Jerry Stafford, Karen Traugh, Shawn Wade, Atana Walker, Dakota Walker, Robert Walters, Miriam Wells, Lucy Williamson, and William Woods.

1996 volunteers included Lee Appleton, Patrick Appleton, Jameson Appleton, Teresa Appleton, Diana Arland, Christene Belt, Margorie Brooks, Carolyn Buff, Louise Bur-

gess, Jacky Carnchan, Richard Currit, Robert Durst, Iva Gabel, Alvin Gabel, Denise Grimm, Sylvia Huber, Kari Kipper, Ronald Kittelson, Marjorie Lovvorn, Marti McGraw, Joshua Miller, Julie Mills, Casey Osback, Donald Peden, Eva Peden, Matthew Porter-Peden, Laura Porter-Peden, James Porter-Peden, Kathleen Porter-Peden, Edward Remeika, William Rhodes, Megin Rux, Jill Thompson, and Marlene Wamboldt.

The entire site staff at Fort Laramie National Historic Site must be acknowledged for their ability to put up with the two summers of disruption and for all the assistance they provided to the field crews. During the course of the project, three Park Superintendents, Gary Candalaria, Doug McCristianson, and William Gwaltney, coordinated local arrangements. Special thanks are due to Steve Fullmer, Becky Eisenbarth, Louise Samson and Shawn Wade for their work in coordinating the project and all the volunteers. Thanks must also be expressed to the Denver National Park Service staff, including Ann Johnson, Adrienne Anderson, and Steven De Vore, for their work in initiating the project and coordinating it from the Regional Office. The Wyoming National Guard in Torrington provided the camouflage netting used for shading over the Block Excavation areas in 1994.

Kathy Fowler, University of Wyoming Department of Anthropology secretary, paid the bills and provided coordination at the University of Wyoming. She helped in many little ways most people don't understand and appreciate.

An earlier version of Chapter Five provided the basis for William S. Woods' Mas-

ter of Arts thesis in Planning titled "*GIS Database Generation of Spatial-Historic Structure Development at Fort Laramie, Wyoming, A National Historic Site*". His committee members, Larry Ostreich (Chair), James Thompson, and Danny N. Walker, commented on that earlier version of this chapter.

Figures 1.8-1.16, 1.18, and 2.1-2.38 are reproduced courtesy of Fort Laramie National Historic Site and the River Basin Survey and National Park Service archeologists who worked at Fort Laramie National Historic Site from 1938 to 1990. Figure 1.17 is reproduced courtesy of the University of Wyoming American Heritage Center. Figures 1.2 and 9.2 are provided courtesy of James Walker and Steve De Vore. Figures 4.1 and 4.2 are courtesy of Steve De Vore. All other photographs are by Danny N. Walker or chapter authors.

Mark E. Miller, Wyoming State Archae-

ologist, and Mary Lou Larson, Department of Anthropology, University of Wyoming, commented on an earlier version of this report. Their comments are highly appreciated and added greatly to its preparation.

Financial or other support for the project were provided by the National Park Service, Denver Regional Office, Fort Laramie National Historic Site, the University of Wyoming, and the Wyoming State Archaeologist's Office, Wyoming Department of Commerce.

Finally, I would like to express my thanks to Dr. George C. Frison, Professor Emeritus of Anthropology at the University of Wyoming, to whom I have dedicated this study. George provided both logistical and moral support for the project from its inception. Without his help, the project would not have begun, much less come to its end.

DEDICATION

To George C. Frison
Professor Emeritus, University of Wyoming
Wyoming State Archaeologist, 1967-1984
Member, National Academy of Sciences

ABSTRACT

Archeological investigations were conducted at Fort Laramie National Historic Site, Goshen County, Wyoming, in 1994 and 1996 along a portion of the north bank of the Laramie River, just below the main fort area. This portion of the riverbank has been long known, perhaps erroneously, as the "Quartermaster Depot Dump." Investigations were initiated to mitigate the effect of stream bank erosion on archeological resources along the Laramie River in this area of the park. The 1994 investigations were the latest in a long series of Fort Laramie archeological investigations that began in 1939, shortly after the property was acquired by the National Park Service. The dump episodes along the riverbank examined during the present study came from several localities throughout the fort. There was also no known record of when these dump episodes occurred.

1994 archeological investigations began with magnetometer and soil resistivity studies. Soil resistance studies were inconclusive in locating military features in that most soil electrical resistance differences across the project area can be attributed to latest 19th and early 20th century homesteading activities. Magnetometer data proved more useful in interpreting a historic dump feature than soil resistance data. Distinct clusters of metallic objects were identified and shown to be scattered over the project area. More than twenty of these metallic clusters can be identified along and near the riverbank. Systematic eight-inch auger probes placed along the riverbank between the known metallic concentration areas showed no major significant artifacts in

the areas that are devoid of metallic objects between concentrations. Augering next to known concentrations yielded relative high numbers of artifacts. Further away from these magnetometer identified concentrations, augering yielded little or no numbers of artifacts.

The application of GIS (Geographic Information Systems) to studies of archeological remains at historic sites was shown to be a valid technique to be used before archeological field investigations. By overlaying a series of historic maps, compiled and adjusted for mapping error, proper location of historic structures can be postulated. Using a single map to identify the location of a structure resulted in locational errors of several tens of meters. While it may not be exactly where that historic structure was originally located, the probability of its predicted location being more accurate than any one map is higher using GIS overlays. Use of this technique in this study was a direct benefit to determining where the Adobe Corral might be preserved.

While lithic tools and other debris that could be attributed to Native American manufacture were recovered from several of the test units, no evidence was recovered suggesting any long term Native American occupation along this portion of the Laramie River bank. Three features distinctly related to post-military occupation were recorded: an elevated irrigation ditch constructed around the turn of the century, a concrete headgate for an irrigation lateral ditch leading from this main elevated ditch, and the 1960s plow zone where attempts were made to loot historic bottles from the dump area before its

transfer to federal ownership.

Military era structural features recorded are represented by a wagon yard fence/wall section and a postulated livestock stable area. Ditches of unknown origin (but Euroamerican) and use were recorded were also recorded. Three features, probably military in origin, were also recorded along Backhoe Trench Two, but not investigated.

Perhaps the most significant finding was the identification of structural remnants of the "Adobe Corral." The north wall of the Adobe Corral lies under the elevated irrigation ditch and , and most of the Adobe Corral has eroded into the Laramie River in the past 20 years, primarily during the 1984 flood.

All historic dump features located within Excavation Blocks One, Two, Three and Four along the riverbank in the project area have been adequately, or in some instances completely, tested or excavated, although some remnants still remain. Additional work on these specific features within these excavations blocks is not warranted. Highly significant to the overall purpose of this study was the finding that major portions of this terrace immediately next to the riverbank do not contain significant archeological deposits. For many years, common thought was the dump was continuous along the entire length of the riverbank in this part of the fort property. We now know the dump deposits are discontinuous, with a large part of the riverbank having no archeological

deposits. This is highly important for the mitigation of the riverbank erosion problem. Twenty-seven features were recorded during the 1994 excavations at the Fort Laramie Quartermaster Dump area. Most of these (17) are individual dump episodes of trash cleanup from the main fort area, representing military (both officers' and enlisted men's) household items and civilian (post sutler's) trade items. Artifacts from these dump episodes date from the 1880s, although portions of at least one dump episode also contains 1890s era artifacts. It is possible an additional minimum of twenty dump episodes remain unexcavated within the project area examined by the remote sensing. These 20 magnetometer identified dump episodes may represent over 60 individual dumping activities.

Perhaps most significant to the overall goals of these investigations was determining that no data were present showing this portion of the Laramie River bank can actually be identified as a "Quartermaster's Dump." All dump episodes show characteristics of being from living quarters or Sutler area cleanups and not activities consistent with the reported procedures for disposal of Quartermaster goods. If there is a "Quartermaster's Dump" at Fort Laramie, it was not along this specific part of the Laramie River bank.

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CHAPTER 1

THE FORT LARAMIE QUARTERMASTER DUMP

by
Danny N. Walker

INTRODUCTION

In 1984, the Laramie River, which passes through Fort Laramie National Historic Site (Figure 1.1), flooded outside its banks. Major erosional damage occurred to the river bank and associated historical and archeological resources (Scott and Conner 1984). The main area of this damage was successfully stabilized, with the archeology investigated and described before and during the stabilization (Scott and Conner 1984). However, the flooding exposed another area of archeological materials downstream from this main impacted area. Scott and Conner (1984) report that:

At the request of the park, the bank was inventoried both to the east and the west to learn if further damage to archeological materials was occurring outside the area recorded here. Further material was found, particularly to the northeast, where a large trash dump was located on the surface. This dump was apparently the main trash repository for the fort, and as such, has a high research potential. However, at the time of this inventory, none of this material could be considered seriously endangered (Scott and Conner 1984:3).

Limited bank stabilization was also attempted here as part of the 1984 work, but it

proved to be inadequate (Figure 1.2). It actually accelerated stream bank erosion in this portion of Fort Laramie National Historic Site. Six large piles of rock were placed along the river bank in an attempt to divert the river further east and prevent erosion of the bank. Instead, the rock piles served to direct the water into the stream bank, rather than away from it. This has formed a "scalped" pattern along the stream bank, with ongoing bank erosion (Figure 1.2). Each spring, following high water, artifacts have eroded from the bank and have been left on the surface of the toe slope (Figure 1.3). How much bank erosion occurred during the 1984 flood and how much has occurred subsequently could not be determined. Based on the amount of erosion apparent at the first rock pile (Figure 1.2), at least ten to fifteen feet has eroded of the affected area.

The National Park Service is proposing additional stream bank stabilization along this portion of the river to prevent continued erosion of the exposed archeological materials. While the construction design is incomplete, it will apparently consist, in part, of cutting the vertical erosional face to the same angle as the toe slope below the face cut (see Figure 1.3) and adding continuous rock rip-rap along the base of the toe slope.

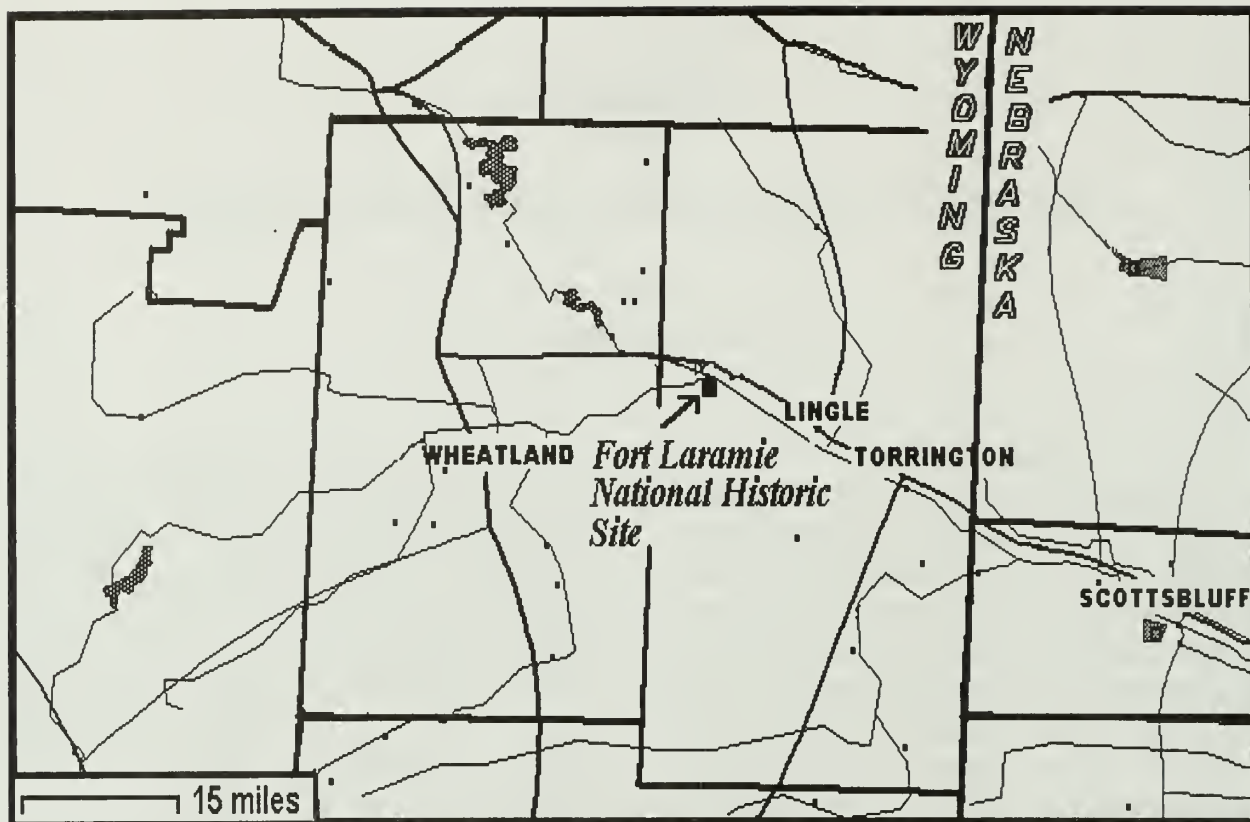


Figure 1.1: Map showing location of Fort Laramie National Historic Site in southeastern Wyoming.

Rock rip-rap probably would be placed on the toe slope, with ground disturbance occurring during this activity. Such action, as presently proposed, would result in adverse effects to known significant historic cultural resources within the project area.

In 1994, the National Park Service contracted with the University of Wyoming and the Wyoming State Archaeologist's Office to conduct archeological investigations (Figure 1.4) in the project area to minimize and mitigate the impact that bank stabilization would have on the cultural resources. A mitigation plan was prepared that provided a series of research questions on Quartermaster Depot dumps in the Western Military Frontier that might be answered during the proposed archeological mitigation. The critical

nature of the project was further emphasized when, in June 1995 after a month of rain and snow melt, the Laramie River again flooded, causing further damage to the project area stream bank (Figures 1.5 and 1.6). Whereas the river averaged one foot deep during the 1994 investigations, during this flood period, the water was over ten feet deep. However, despite stream bank erosion, there was little loss of cultural materials apparent.

BACKGROUND INFORMATION HISTORY

A full history of Fort Laramie National Historic Site will not be presented here. This has been detailed elsewhere (cf. Heib 1954; Mattes 1978, 1980; Lavender 1983; among others). A brief review of pertinent



Figure 1.2: Aerial view of project area, showing erosional scalloping of stream bank following placement of rock piles in 1984. Left = 1996. Right = 1993 (photograph by James Walker).



Figure 1.3 Quartermaster Depot Dump area in 1994, looking downstream. Note eroding vertical cut face on upper part of stream bank. Following stabilization, this will approximate same angle as present toe slope.

historic data and general significance of the site will, however, be discussed.

There are three broad periods of time that can be identified at Fort Laramie National Historic Site, relative to the Euroamerican occupation. The first of these is the Fur Trade Period (1812-1849). The fort site

itself, was "permanently" occupied in 1834 with the construction of Fort William, which was used as a fur trading post. The earliest Euroamerican visitation of the area probably occurred in 1812 when the eastward-bound Astorians, headed by Robert Stuart, passed through the area (Hafen and Young 1938).



Figure 1.4: 1994 archeological investigations at the Fort Laramie Quartermaster Depot Dump. Block excavations were placed along the edge of the river bank.

Many other trappers passed through between 1824 and 1842.

The U.S. Army purchased the site to provide a base for protection of travelers along the Oregon Trail in 1849. Thousands of emigrants bound for Oregon and California passed through the Fort Laramie area on the Oregon Trail in the 1840s and 1850s (Hafen and Young 1938; Mattes 1980). The Army, or Military Period, lasted from 1849 until 1890. Fort Laramie was a major post in Western Military history, serving as the base for much of the activities during the "Indian Wars" of the 1860s and 1870s.

The fort and military reservation were abandoned by the military in June of 1890, and turned over to the Department of the Interior. That agency sold the property to homesteaders and other Euroamerican set-

tlers. Many buildings were removed from the property to be used elsewhere. This was apparently the situation with many Quartermaster Corps buildings. The fort area served as the home ranch of at least three homesteading operations from this time until the mid 1930s. By then, many remaining buildings were deteriorating, so the State of Wyoming decided to buy the property to preserve the fort. Following the purchase, the state transferred ownership to the National Park Service, which began administering and restoring the site in 1938.

PREVIOUS ARCHEOLOGICAL INVESTIGATIONS

Archeological investigations have been undertaken at various locations throughout Fort Laramie National Historic Site since the



Figure 1.5: Fort Laramie Quartermaster Dump Project Area during 1995 flood. Contrast rock pile in left center of photograph with same rock pile in center of Figure 1.4.

late 1930s (Smith 1939; Hendron 1941a, 1941b; Beaubien 1941, 1951a, 1951b, 1953; McNutt 1958) with investigations continuing during the 1960s (Husted 1964), the 1970s (Anderson 1973; Cellar 1976, 1978; Ehrenhard 1972, 1973b; Falk 1971; Husted and Moore 1970; Weymouth 1979) and the 1980s and 1990s (De Vore 1988, 1990; Heimmer et al. 1988; Samson 1986; Scott 1987, 1989, 1990; Scott and Conner 1984; Scott et al. 1992; Sudderth 1985; Sudderth and Raish 1990). All these studies have been directly related to cultural resource management and reports are available as in-house publications. Only the excavations at the Rustic Hotel (Ehrenhard 1973a) were research oriented and published in a research journal.

Over the last 55 years Fort Laramie has been the subject of at least 21 separate archeological investigations. Several of

these were simple inventories that yielded no cultural debris. However, most studies did record artifacts or evidence of structures related to the occupation of the fort. Limited evidence points to at least one prehistoric occupation of the area occupied by the fort, but to date this evidence is very ephemeral. The fur trade era is well documented in the historical sources, but there has been very little archeological evidence discovered that relates to this important era. The military period is well represented in the archeological record. No definitive synthesis has been assembled to pull the diverse reports together and collate or correlate the information contained in them. There is no doubt that Fort Laramie has a rich archeological record that extends at least from the fur trade occupation to farm and ranching activities (Scott, Sudderth and Schoen 1992:8).

Armstrong, Niven, and Walker (this volume)



Figure 1.6: Two views of Fort Laramie Quartermaster Dump Project Area during 1995 flood. Upper, looking upstream with Block Excavation Area One in right center; Lower, Block Excavation Area Four in center.

present a detailed description of these early archeological excavations at Fort Laramie.

It also should be pointed out that most of these investigations were all directly related to building restoration or utility trenches in the main fort area. Three projects were surveys conducted on the south side of the river, away from the main fort area (Anderson 1973; Cellar 1976; Husted and Moore 1970). The potential for additional scientific data away from the main area is great and should not be ignored when attempting to learn about the military history of Fort Laramie. The present project provides a sample of these valuable data.

THE PROJECT AREA

The area under investigation in this project (Figure 1.7) is north of the main fort area, along the west bank of the Laramie River. The Quartermaster's Depot was originally placed on the terrace immediately northwest of the project area. Many buildings and corrals were associated with this Depot over the 40 years of military occupation (Figure 1.8). The structure closest to the project area was an "adobe" corral (discussed further below) with associated teamster quarters. The study area is just upstream from where the river makes a short turn to the east and then another back to the northwest. Presently, the Quartermaster's Depot Dump is believed to be restricted to the upper two river terraces (T1 and T2) in the study area. The modern terrace (T0) often contains artifacts that have eroded from the next higher two terraces. Most in situ artifacts occur in the T2 terrace. Artifacts found on the surface of the T1 terrace are either in situ or have been secondarily deposited on the surface of this terrace.

HISTORIC INFORMATION ON THE PROJECT AREA

The Quartermaster Depot Dump

. . . The Quartermaster's Department is charged with the duty of providing the means of transportation of every character, either under contract or in kind, which may be needed in the movement of troops and material of war. It furnishes all Government animals employed in the service of the Army, the forage consumed by them, the wagons and all articles necessary for their use, with the exception of the equipment of cavalry and artillery. It furnishes clothing, camp and garrison equipage for the troops, the shelter and buildings for them and for the stores which they require, constructs and repairs roads, railways, and bridges needed for military purposes, builds and charts ships, boats, docks, and wharves, and, finally, attends to all those matters connected with military operations which are not expressly assigned to some other bureau of the War Department . . . Subsistence, ordnance, medical, and hospital stores are purchased and issued by other departments, but the Quartermaster's Department transports them to the place of issue, and provides store-houses for their preservation until consumed . . . (U.S. Army 1889).

The main historic feature known to be present in the study area is the dump which is eroding into the Laramie River. This dump is called, and presumed to be, the Fort Laramie Quartermaster Depot dump because of its spatial relationship with the Depot area itself and the types of cultural materials that it contains. No known historic documentation exists that ties this dump to the 40 years of Quartermaster Corps occupation in the area. More than likely, this dump is at least a dump associated with this activity, but it may not be the only Quartermaster dump.

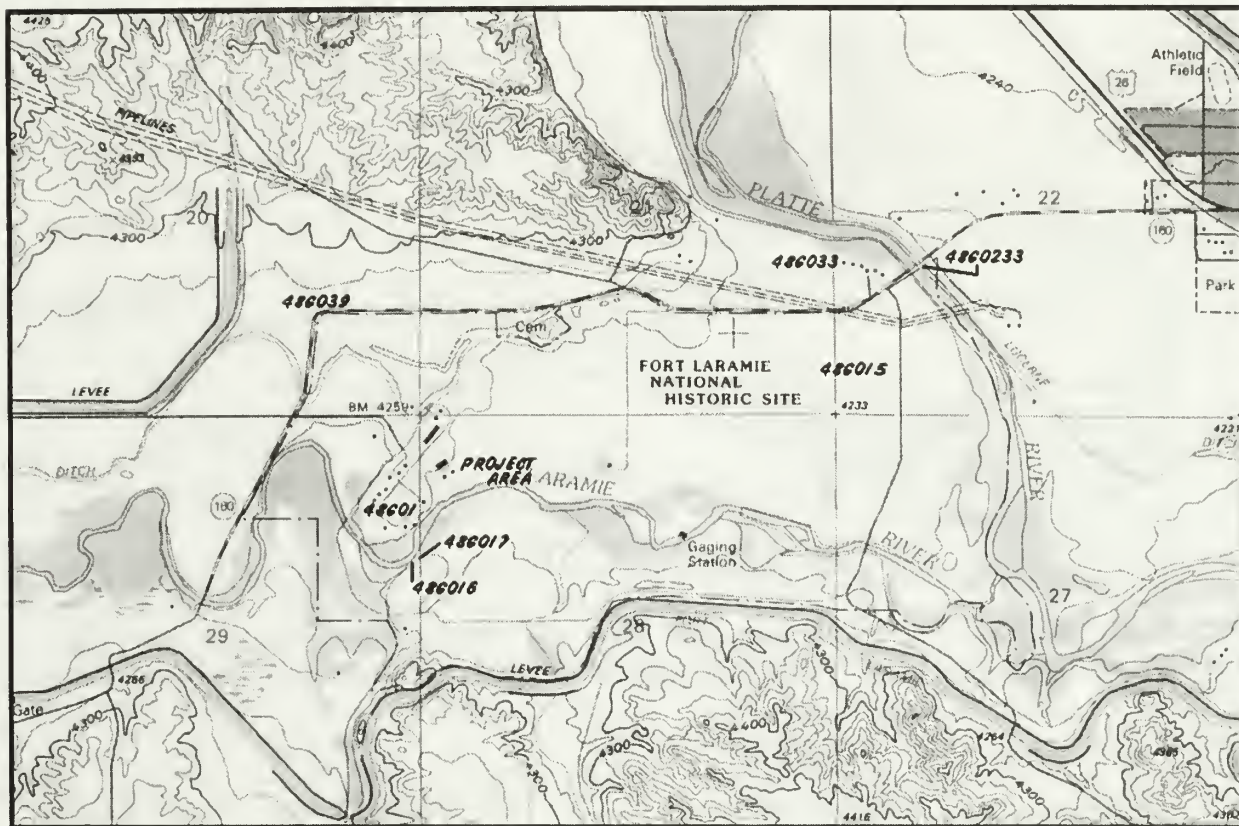


Figure 1.7: U.S.G.S. topographic map of Fort Laramie National Historic Site, with Quartermaster Dump project area outlined. Also noted are other historic and prehistoric features on record at the Wyoming State Historic Preservation Office.

While this dump might not be the only "Quartermaster Dump," it will be called this during the present report, by convention. It is known that the Commissary department had its "own" dump on the south bank of the Laramie River (Steve Fullmer, personal communication, 1994), directly across the river from the present project area. Based on surface distributions of the artifacts, at least toward the end of the military occupation, there was no single locality being used as a dump. Artifact concentrations can be found scattered over an area about 300 meters by 200 meters. If the Quartermaster Depot Dump actually covers this large an area, the

area currently being impacted by the river bank erosion represents only a small portion of the remaining dump area.

It is highly probable that the dump in the present project area was also used by other fort occupants. Historic documentation suggests that, at various times, this and other dumps scattered around the fort were "cleaned up." The debris from these cleaning episodes was thrown into the Laramie River or moved away from the main fort, most likely into the project area, which is both downstream and downwind (at least of the prevailing wind direction).

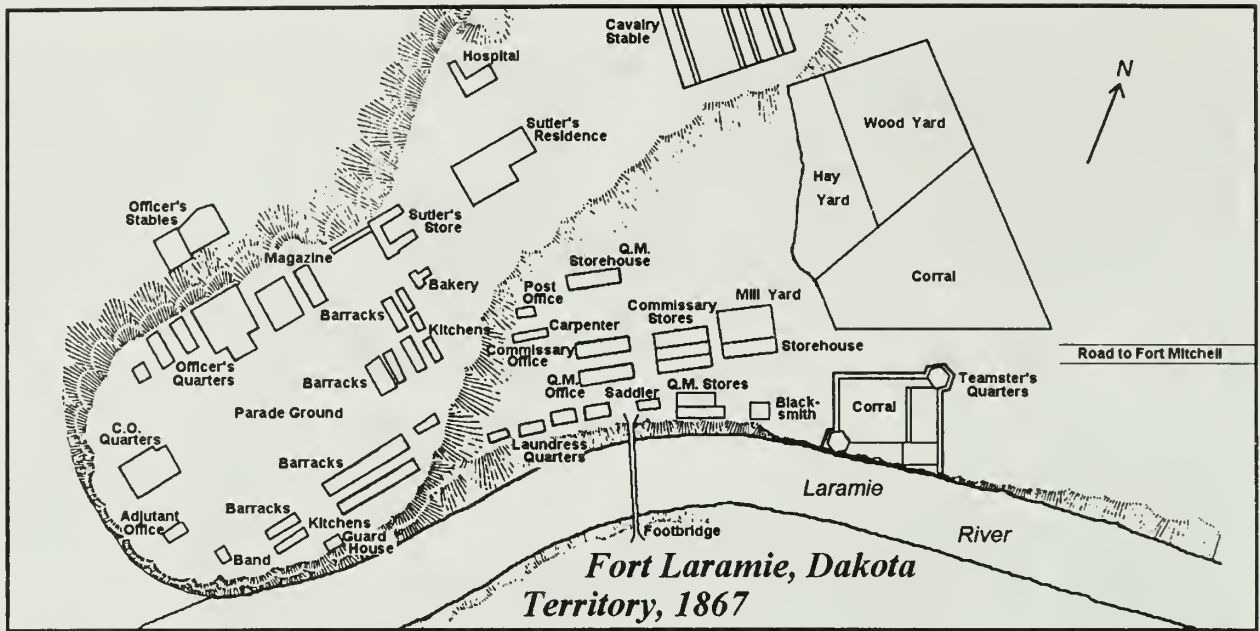


Figure 1.8: Plan map of Fort Laramie, from March 1867. Approximate location of project area in middle right area of map, near and downstream from structure marked "corral" (courtesy of Fort Laramie National Historic Site).

... the slops are collected from all the quarters in the garrison once a day and fed to the pigs. 2nd all other rubbish is carted away below the Post and thrown into the Laramie River ... (Schell 1868).

... The Policing is done regularly and efficiently with the exception that Offal and Refuse material are deposited too near the garrison ... (Girard 1869).

... the slaughter house [on the west end of the parade ground] be immediately removed and that the ground on which it now stands be put in thorough police. A spot about 500 yards further down the river [approximately the present project area] is recommended as a new site. At this place the current which is strong and deep strikes the bank. The new shop should be constructed so as to allow the offal to fall directly into the stream instead of remaining on the bank as it now ...

(Buchanan 1872).

... The general police of the Laramie river in the immediate vicinity of the post is bad. And the peaks of manure from the cavalry stables and the filth & rubbish from the post, all of which has accumulated & been deposited for many years on the north side of and immediately contiguous to the post, is offensive in every particular ... general nuisance ... (Hartsuff 1874).

... The troops of the garrison were excused from drills for several days and large fatigue parties were turned out to police the Post. All the officers' yards, the river front and the Post generally under went a thorough policing ... (Carvillo 1880a).

... The police of the Post has been very good during the month except the river front in the vicinity of the Commissary Sergeants quarters and

quartermasters corral which require further policing . . . (Carvillo 1880b).

. . . The premises about the citizen blacksmiths qts. are habitually worse policed than elsewhere, because no one in particular appears to be responsible for the policing of the same . . . (Carvillo 1881).

. . . the river bank in rear of Cos. H, A, and Band, is used as a receptacle for old tin cans and other offal which should be removed and further deposits prohibited. The pig pens in rear of Cos. C & I should in my opinion be removed and the ground policed, also those on the river bank . . . (Caldwell 1884).

. . . the dumping of refuse on the river bank near the Quartermasters Office should in my opinion be discontinued and the refuse be carried further away from the garrison . . . (Caldwell 1885).

. . . I recommend that the refuse which has been accumulating for some time at the post dumping grounds be collected into heaps and burned . . . (Brechemin 1886).

. . . I also recommend that the refuse material, which has been accumulating for some time at the post dumping grounds be collected into heaps and burned . . . (Brechemin 1888).

The possibility exists that trash and garbage from all over the main part of the fort was dumped into the Laramie River, just below the Quartermaster's Corrals and Depot area. It is unknown whether the post dumping ground referred to by Brechemin (1886, 1888) was this Quartermaster's Dump, the Commissary Dump, or both. It was probably the latter. If the Quartermasters Dump was ever cleaned up as recommended by Brechemin, physical evidence in the form of burning would appear during archeological

investigations.

Historic documentation on the Quartermaster Corps operations at Fort Laramie is sparse. Some general correspondence is available (on file, Fort Laramie National Historic Site), but detailed records and inventories are not available locally. These were apparently "destroyed" at the National Archives in Washington, D.C. during the late 1950s or early 1960s:

. . . Although he was prohibited from entering the stacks where these records were kept, the archivist in charge wheeled in to the study area a heavy truck load of original Fort Laramie record books, in bound ledger form. All he had time to do was to sample some of the contents and make a rough checklist of the volumes for future reference . . . included Orders, records of the Councils of Administration . . . Guard Reports, Morning Reports, Board of Survey, Clothing Books, Records of Deaths and Internments, Quartermaster and Subsistence Records, Passes and Furloughs . . . Roy Appleman of the History Branch wrote to advise that most of these records had been destroyed [emphasis original] by the National Archives in one of its own little private records disposal programs . . . had destroyed all such categories of records for all U.S. Military posts, many others of which were in or candidates for the National Park System! (Mattes 1980:220-221).

There has been some recent indication, however, that not all these documents were destroyed. Recent researchers at the National Archives report some Quartermaster Corps records are beginning to reappear (Steve Fullmer, personal communication, 1994).

At least twelve structures associated with the Quartermaster Depot can be deduced from the various records (Luhn 1870) and

site maps that are available (i.e., Figure 1.8). There are also some records suggesting that, especially during the early military occupation, many of the various supplies were not within buildings, but were stored under tarps or in tents:

. . . The property appertaining to the Quarter Masters Dept. is stored, partly in an old slab building, mud roofed and mostly gone to decay, and partly in three store tents which are old and worn. The property is constantly liable to damage from rain and the falling of the slab building, furthermore it is not safe from being stolen . . . (Higgins 1857).

. . . Substantial store houses are much needed at this Post . . . buildings for Subsistence and Qr. Mr. stores could be erected by the troops with but little expense to the Government, while that gov't would in a short time be saved thousands of dollars, as the fearful wastage and damage done heretofore to supplies will show . . . (Moonlight 1865).

As should be expected, this was not a satisfactory situation, and many supplies were ruined. The disposition of these ruined supplies is unknown. Considering the long distances back to "civilization," permission was granted to dispose of some surplus, unserviceable property locally, but other property was returned to regional headquarters for surplus (Childs 1866).

. . . The Inspector's report will state the exact condition of each article, and what disposition it is expedient to make of it: as, to be destroyed, to be dropped as being of no value, to be broken up, to be repacked or repaired, or to be sold . . . The authority to inspect and condemn will not, without special instructions, be exercised by command-

ing officers of arsenals with reference to ordnance and ordnance stores, but only in regard to other unserviceable supplies . . . An officer commanding a department, or an army in the field, may give orders . . . to sell, destroy, or make such other disposition of any condemned property as the case may require -- ordnance and ordnance stores alone excepted . . . Separate inventories must be made of the articles to be repaired, of those to be broken up, those to be sold, to be dropped, etc. . . The Inspector will mark the letters I. C. (inspected -- condemned) upon all property condemned and ordered to be dropped from the returns, with a brand, stencil, cold chisel, steel cutter, or punch, depending upon the material to be marked. Should it happen when final action is had, that the Inspector's recommendation is disapproved, the marks will be cancelled, and a certificate of the fact will be given to the officer accountable . . . (Brinkerhoff 1965:151-152).

Detailed records are not available on procedures actually used to dispose of property not sold to immigrants or returned to regional headquarters. That some was disposed of in local dump areas can be deduced from material eroding today. Many examples of smashed and destroyed buckets, shovels, and other equipment have been seen along the river bank below the fort (Steve Fullmer, personal communication, 1994).

Materials known to be in the project area dump include bottles, cans, barrel hoops, other metal, bone, ceramics, leather (including shoes), arms and ammunition and some military uniform parts. All these artifact types have eroded from the bank and been collected since 1984. As stated above, most of the Quartermaster records and inventories are not available, but some correspondence is on file (Fort Laramie National Historic Site).

These letters suggest that many foodstuffs were ruined and disposed of, possibly in this dump. Based on the recommendations to move the Fort butcher shop from the west end of the parade ground to this area, massive amounts of butchered bone should be present as well. There is also some listing of hand tools, other equipment, clothing, and ordnance that was stored at the Depot. The Quarterly Return form for the Quartermaster Corps has space for inventory of the following items, any one of which could be in the dump: fuel; forage; straw; stationery; office and barrack furniture; veterinary tools, blacksmiths' tools; farriers' tools, carpenters' tools; wheelwrights' tools; masons' and bricklayers' tools; saddlers' tools; miscellaneous tools, machinery; and miscellaneous stores for expenditure, such as building materials, bricks, horse medicines, horse shoes, lumber, rope, steel, etc. (Quartermaster Corps n.d.).

A phenomenal amount of material also passed through the Fort Laramie depot on its way to the forts to the north during the Indian Wars:

. . . By mid-February quartermaster and commissary activities at Fort Laramie, Fort Fetterman, and the Cheyenne Depot had been stepped up . . . These public stores consisted of a broad range of goods necessary to the campaign, including ammunition, rations, grain and forage for the animals, and what the army conveniently labeled "clothing, camp, and garrison equipage," or "CC&GE." Individual posts were also receiving these essential items, in addition to stocks of related goods required for general operations . . . (Hedren 1988:54).

. . . Sheridan, perhaps anticipating a prolonged campaign season, required that these posts maintain ammunition

and various ordnance stores beyond their immediate needs for transfer to officers and commands as necessary. Each of these posts increased its stocks accordingly, and henceforth, in addition to the routine movement of supplies between the [Cheyenne] depot and individual garrisons, shipments between posts would grow to noteworthy proportions . . . (Hedren 1988:62).

Some of this material stayed at Fort Laramie, most of it was sent north. If the storage at Fort Laramie remained the same, some of that material had to have spoiled and been disposed of. Similarly, after the end of the Indian Wars, disposal of a massive amount of material had to have occurred. Whether this was done locally or the equipment shipped back to other Quartermaster Corps depots is presently unknown.

The "Adobe" Corral And Wood Wagon Yard

Immediately next to the river bank in the Quartermaster Corps area was a large corral area supposedly constructed of adobe (dried clay) bricks:

. . . a fortified adobe redoubt which, when not needed as a fortification, could serve as a corral for Quartermaster Department animals and as quarters for the teamsters. By September 1 [1866], adobe bricks were being made. By September 13, 1866, every available man at the fort was on duty with the Quartermaster Department . . . on the new redoubt. The redoubt was being erected by a fatigue detail of the 2nd cavalry. It consisted of an area of about 2 acres enclosed by an 8 foot high adobe wall with two blockhouses. These blockhouses, at the northwest and southeast corners . . . a perfect hexagon, and both were single story buildings. Their adobe walls were more than three feet thick. One side of each blockhouse was inside the enclosure

and had a door and a dormer window in the roof. The other five sides were outside the adobe walled enclosure and each of these sides had a single cannon or rifle embrasure. The roof was hexagonal also, and was supported by a single center post and a system of rafters. The blockhouses, if not the wall, were built on stone foundations, and the whole redoubt was surrounded by a trench three feet deep which served as drainage to keep water away from the adobe walls, and also made it more difficult for any enemy to scale the walls . . . walls were entirely of one material -- adobe . . . stone [was used] only for foundations and he used lumber only for the roofs and their supporting rafters and for the window or embrasure frames . . . enclosure was used as a corral for Quartermaster Department horses and mules and the two blockhouses served as teamster living quarters, with a temporary kitchen haphazardly tacked on to one of them . . . (Chappell 1962: 158-160).

. . . The old fortified adobe redoubt did not fare half as well. It was never needed for the purpose for which it had been built. The army called it 'the old fort' and by 1876 its real origin was so clouded and obscure that the wife of an officer wrote that it had been 'built by a fur company before the post was established.' It continued to appear in photographs and plans until 1883, and some time in the next six years completely disappeared. Perhaps the flood of 1883 weakened or destroyed it; perhaps several floods were required to do the job . . . (Chappell 1962:162).

. . . New Sod corral [sic] 300 Feet long by 165 Feet wide with a Bastion at the North and South corners the Corral is capable of containing about 400 animals, the Bastions are used as Quarters & Mess Houses for teamsters & employees connected with the Corral and for Store Houses for harness & C . . .

(Luhn 1870).

The earliest map showing the "adobe" corral is the 1867 map of the fort buildings (Figure 1.8). This coincides with the 1866 construction date. The structure continues to appear in the 1870 map, the 1871 map and the 1874 map. The structure is missing from the 1888 map (Figure 1.9). A photograph of this area of the fort taken in 1883 shows the corral to be still in existence (Figure 1.10). Exactly when the structure was removed (between 1883 and 1888) is not known. If the complete Quartermaster Corps records were available, they might shed some light on this removal.

The structure appears to have been in excellent condition during the treaty council of 1868. Several photographs of attendees of that council are available and provide details of its appearance (Figure 1.11). This may have been one of the more impressive utilitarian structures at the fort. The 1870 report of building condition (Luhn 1870) has the building being in "good" condition. The 1876 report (Morton 1876) however suggests the structure was starting to deteriorate, with 30,000 linear feet of lumber costing \$562.50 being requisitioned for repairs. The 1883 report shows total repairs of \$16.40 (Hardin 1883) so it must have been back in a "good" condition.

One can only question, however, why it was built so close to the river (Figure 1.12). Immediately north of this "adobe" structure, a solid wood "wagon yard" was added at an unknown date (Figure 1.13). This structure was also in good condition during the 1868 Treaty Council (Figure 1.14), but again, both its exact construction and demolition dates are unknown. It was probably built after the "adobe" corral. The earliest the wagon yard appears in the fort maps is 1871, but it ap-

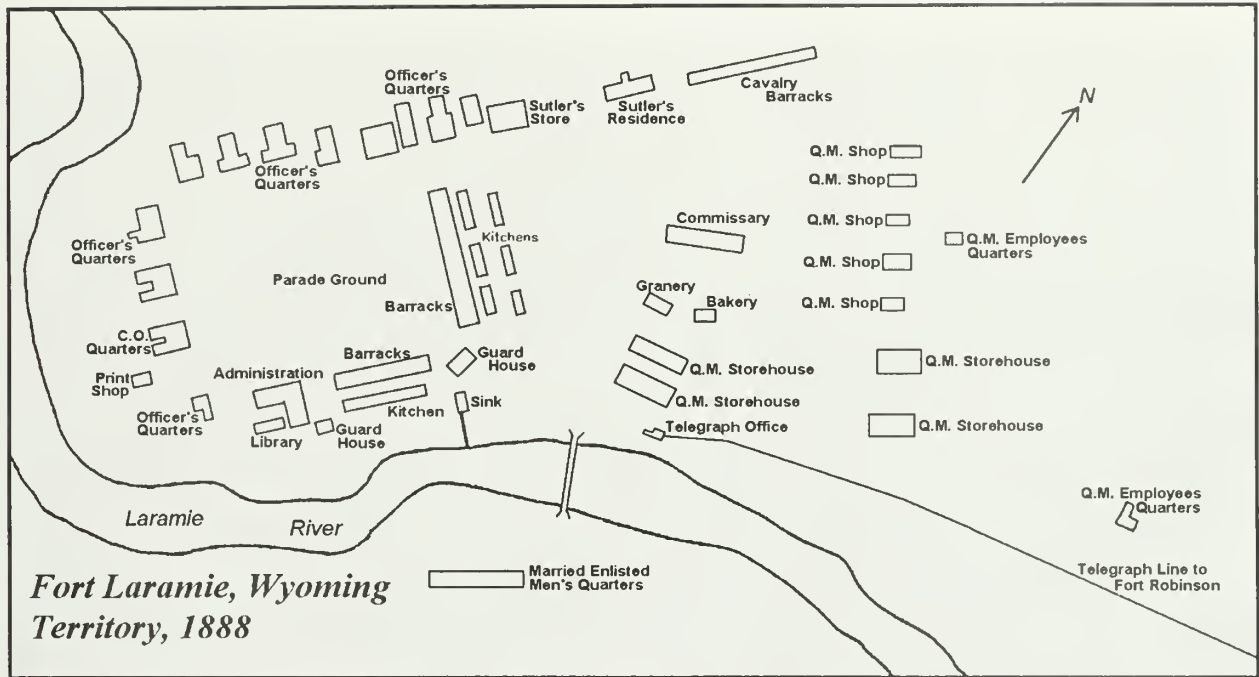


Figure 1.9: 1888 military map of Fort Laramie. Note absence of adobe corral and wagon yard from lower right corner of map (courtesy of Fort Laramie National Historic Site).

pears in the 1868 photographs (Figure 1.14) so it was around at least by then.

The 1851 Saw Mill

At least one earlier structure (pre-"adobe" corral) existed in this area of the fort. This was the location of the original steam powered saw mill (Figure 1.15) used for building construction during the first ten years of fort occupation (Figure 1.16). This structure caught fire and burned on January 15, 1859 (Follett 1859a). Following its repair, by July 1859, the saw mill was back in operation, but not at its earlier location:

... The Public saw mill, which was destroyed last January, will be in operation again, during the present month, and in a different locality where there is timber convenient to keep the mill running for years ... (Follett 1859b).

This new location was apparently some

distance from the fort:

... there is a Saw Mill in running time but forty miles distant [on Laramie Peak], with a large quantity of lumber already sawn up ... (Moonlight 1865).

This saw mill continued in operation for some time, and was expanded in 1867 to include a shingle machine (Auger 1867), despite arguments that it was wearing out:

... The Saw Mill on hand is about worn out, so much so, that it cannot be removed, and be serviceable at another point, the one required should be located at a point ten miles farther from the post ... (Camp 1867).

The saw mill operations were back on the fort site by 1886, but again, constantly plagued by fires. The new location was on the west side of the fort, below the trader's post. The original building on this site was



Figure 1.10: 1883 view of Fort Laramie from the east. Southeast bastion of adobe corral in center of photograph, with wall extending to the right. Northwest bastion on right edge of photograph (courtesy of Fort Laramie National Historic Site).

again, like the 1851 structure, made from wood. It burned down in May 1887, and replaced later that year with a lime grout structure (Brechemin n.d.) that is still standing. Fires were common occurrences at saw mills, but there were no more saw mill fires at Fort Laramie after 1887 (Steve Fullmer, personal communication, 1994).

As stated earlier, the exact location of the 1851 saw mill is not known. The possibility does exist for evidence of it to appear in the proposed archeological work. However, it is unknown if this burned structure can be separated from the dump burning episodes. There should be distinctly different artifact

assemblages, if the saw mill area was covered and not further disturbed over the next 40 years of military occupation.

The Post 1890 Occupation

Another feature in the proposed project area that should be recordable is a plow zone, unrelated to agricultural practices, from the last civilian owner of the project area before it was taken over by the National Park Service:

. . . Knowing that the Government required the land for the benefit of posterity, and knowing that their actions were destructive, even though not technically illegal . . . they destroyed



Figure 1.11: Civilians at the 1868 treaty council. Note Adobe corral southeast bastion along right edge of photograph and construction of wall (courtesy of Fort Laramie National Historic Site).

much of the old military dump by plowing it up recklessly to collect bottles and other relics which abounded there. This latter action was understood to be at the behest of commercial collectors who figured to be just one step ahead of NPS enforcement of the Antiquities Act of 1906, making such vandalism (on federal lands) a federal crime. According to the beleaguered Superintendent, these deplorable actions "were not forestalled by appeals to their nobler nature . . . (Mattes 1980:323).

Plow zones such as this often are distinctive and easily recognizable in the archeological record. It is not known how close to

the river bank this plowing was conducted. It is possible that the part of the bank closest to the river was not disturbed, depending on how far this bank has eroded since the late 1960s. Also, this plowing was not as extensive as Mattes' statement would lead one to believe. Apparently the plow furrows were not next to each other (continuous) or completely covering the area, but separated by several feet (Charles Potter, personal communication, 1994). There are probably intact dump deposits lying between the plow furrows that were never disturbed. This would make the plow zone even easier to recognize.

Relative to this post-military occupation



Figure 1.12: 1868 photograph of southeast bastion of adobe corral. Note proximity to Laramie River west bank (courtesy of Fort Laramie National Historic Site).

and disturbance in the project area, at least two "modern" irrigation ditches are present. One of these was apparently constructed around 1910 (Figure 1.17). Both these ditches are still visible, but their positions relative to features discussed above is unknown. These are elevated ditches, and one question that arises is whether they were placed on an existing elevated feature, such as the remnants of a wall from the "adobe" corral.

PREHISTORIC AND HISTORIC NATIVE AMERICAN OCCUPATION

While the Fort Laramie Quartermaster Dump Project was designed to examine and mitigate the effects of the stream bank stabilization on the Euroamerican military and homesteading activities, it must be recognized that Native Americans also occupied the fort area. This occupation was both prehistoric (Scott and Conner 1984) and

historic, at least during the 1851 and 1868 treaty councils (Figures 1.14 and 1.18). Most of this historic occupation was across the Laramie River, on the opposite bank, but the various tribal groups are also suspected to have camped on the west bank as well (Steve Fullmer, personal communication, 1994).

The nature of the prehistoric Native American occupation along the Laramie River bank is unknown. In fact, there may be no evidence of it in the study area. If present, any prehistoric occupation may have been so disturbed by the military occupation that distinct intact occupation levels would lack integrity and be unrecognizable. No distinctly Native American items have been discovered among the material eroding from the river bank since 1984. Similarly, the historic Native American occupational evidence may be so ephemeral that it might not

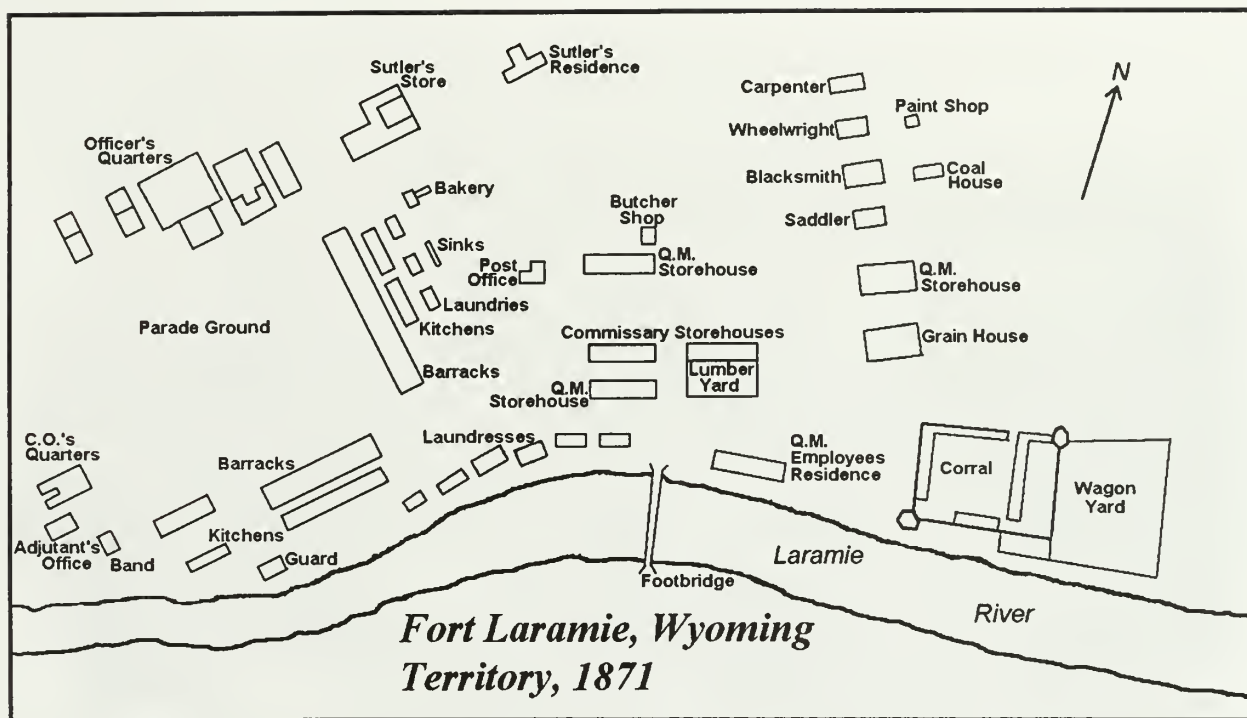


Figure 1.13: 1871 military map of Fort Laramie. Note position of wagon yard northeast of adobe corral in lower right corner of map (courtesy of Fort Laramie National Historic Site).

be separable from the military occupation. This is especially so since many artifacts used by the Native Americans while at Fort Laramie were furnished by the military. This occupation probably could be separated from the military occupation by noting evidence of Native American modifications of the Euroamerican trade and military goods.

ARCHEOLOGICAL INVESTIGATIONS AT THE FORT LARAMIE QUARTERMASTER DUMP: RESEARCH QUESTIONS

The Wyoming State Historic Preservation Office has developed a comprehensive plan for directing research on the history of Wyoming (Massey 1990). Part of that development was preparing a "context" for future research on military history in Wyoming (Rosenberg 1989). That document reviewed

what was known about the military history of Fort Laramie, but primarily proposed future research only on military trails and roads in the state. The archeology of Fort Laramie was reviewed (see references above), but no discussion was presented how, or even if, research into the day to day life of soldiers should be conducted. Research questions concerning this context can be presented relative to the present project.

Several goals and associated research questions for mitigation of cultural materials in the stream bank stabilization project area were proposed (Walker 1994). First, samples of archeological materials related to refuse disposal from the Quartermaster's Depot and other areas of the fort would hopefully be obtained. The second goal was to attempt to reconstruct different aspects of the past lifeways of the fort's occupants during the nineteenth century. Discovering



Figure 1.14: 1868 photograph of Native Americans attending the treaty council of that year. Note wood wall of wagon yard in background (courtesy of Fort Laramie National Historic Site).

exactly how much of, and where this dump area remains intact was a third goal of the project. The fourth goal was to attempt to find out if any portion of the "adobe" corral was still extant, while a fifth goal was to attempt to find out if the 1850s saw mill structure was within the immediate project area and if it could be recognized.

Sampling 1840s-1860s archeological materials

Most datable artifacts that have eroded from the dump are felt to have been manufactured in the 1860s (Steve Fullmer, personal communication 1994). These datable artifacts suggested this feature would be one of the earliest military features recorded at the fort and proposed for archeological

investigations. This fact is especially important when considering most previous archeological investigations at Fort Laramie have been associated with 1870s and 1880s era buildings. The earlier occupation (i.e., 1850s and 1860s) is known only from the historical record, which can be best characterized as sparse.

While artifacts eroding today are primarily appearing to date to the 1860s, some of this dump area away from the river could be datable to the later decades of military occupation, or even to the homesteading period. We know material from those time periods, at least the military period, was moved to the dump area, but what happened to it since its placement? Is this evidence the Quartermas-

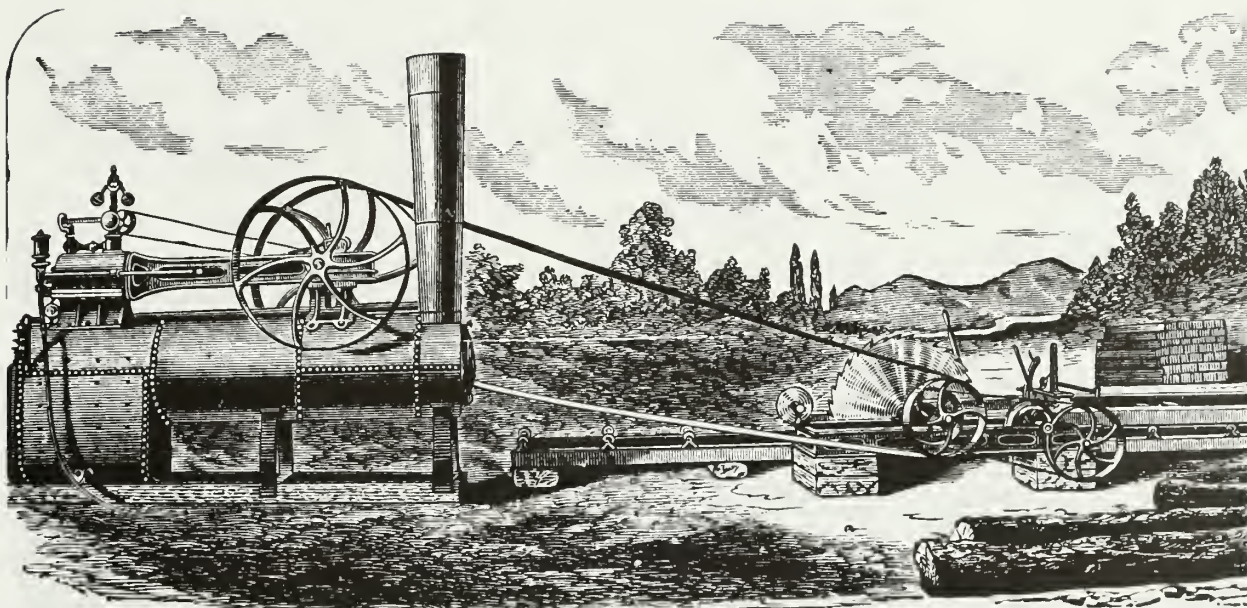


Figure 1.15: Line drawing of steam powered sawmill, probably similar to one used at Fort Laramie in 1850s (courtesy of Fort Laramie National Historic Site).

ter Corps was periodically putting materials in the dump (i.e., monthly, yearly, etc.) with each apparent surface concentrations representing distinct dump episodes (see South 1977)?

Reconstruction of past lifeways

Several different aspects of past lifeways at Fort Laramie could be addressed using data from the project area. These encompass specific aspects of both domestic and military life (see Rosenberg 1989) at Fort Laramie. Specific topics include feature use and correlation of historical records with material remains in the project area; subsistence studies of residents in this area of the fort; studies on economic and social structures of residents; and intensity of post-1890 occupation.

Was this area strictly the Quartermaster Depot Dump area, or did the Post Surgeons (see quotes above) cause material from all over the fort to be placed here? Can these be

separated archeologically? Is the existing pattern of surface distributions of artifacts for real, where the Quartermaster Corps dumped buckets in one area, shovels in another, cans in still another, bottles in a fourth, etc.? Were the materials moved at the instigation of the Post Surgeons carried to the area (directly across the Laramie River from the Quartermaster Dump) now called the Commissary Dump? How much of this dump was from the civilian employees of the Quartermaster Corps and not the military? Is any of this dump area the result of the homesteading activities at the fort after abandonment by the military?

If this dump area is entirely military, how does it compare with similar main dump areas from other western military forts? Dumps have been excavated at many of these forts [e.g., Fort Bowie (Herskovitz 1978); Fort Supply, Oklahoma (Briscoe 1992); Fort Fred Steele (Miller and Wedel 1992); Pow-

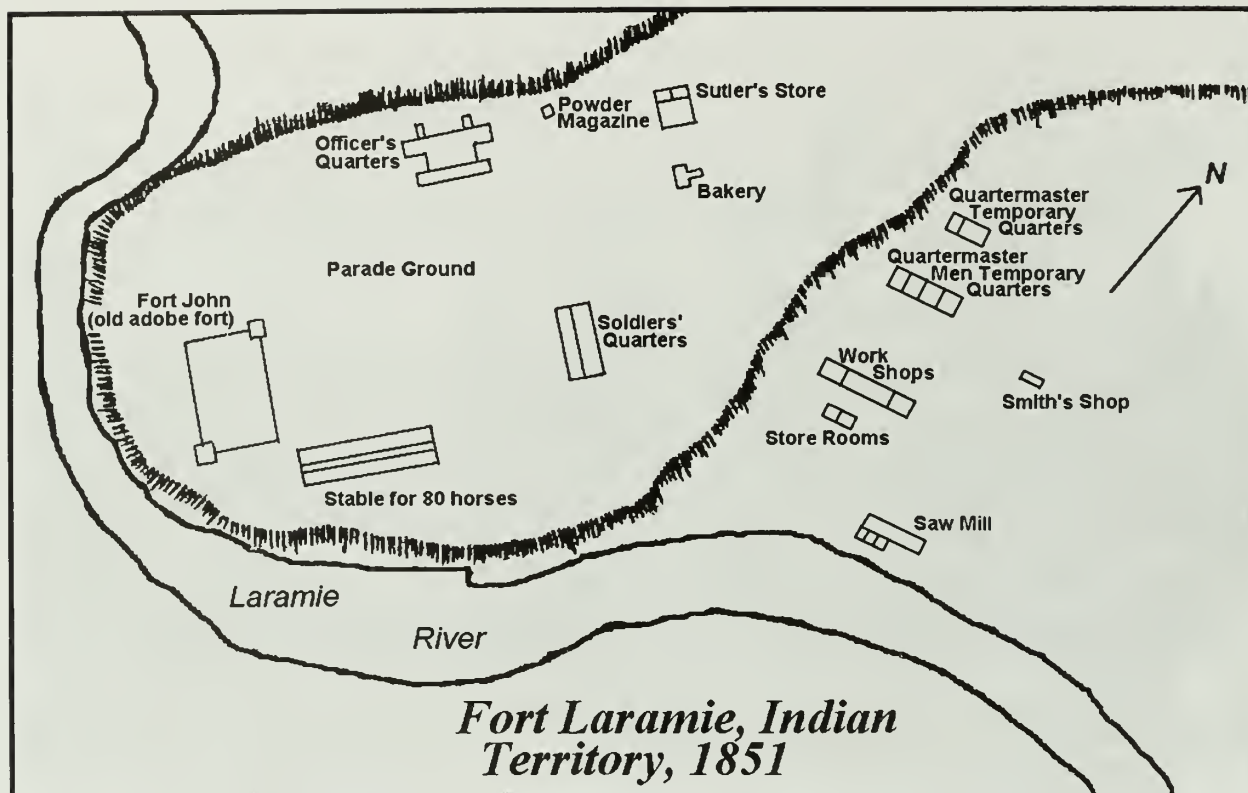


Figure 1.16: 1851 military map of Fort Laramie, showing location of sawmill in lower right corner of map (courtesy of fort Laramie National Historic Site).

der River Supply Depot (Jerry Clark, in prep.); among others (Dr. William Lees, personal communication 1994; Dr. Richard Fox, personal communication 1994)]. However, these dumps were all associated with specific structures or latrines and were not specifically in a Quartermaster Depot dump.

This area of Fort Laramie also might be particularly suited to investigation of marginal activities. Specifically, certain activities occur only on the edge of settlements. Such areas are often chosen for illicit and other socially condemned activities. Since this area was primarily occupied by civilian employees of the Quartermaster Corps and not soldiers whose lives were supposedly regimented, the "garbage" should be distinctive and more "marginal" than that of the

military from the main fort area. If "marginal" activities occurred here, such should appear in the archeological record if the dump were associated purely with these civilian employees. There are daily report records that such marginal activities did occur in this area, with many soldiers "con-sorting," by gambling and drinking with the teamsters (Steve Fullmer, personal communication, 1994).

Feature use and correlation of historic records with material remains

Exactly how do the "adobe" corral and associated wagon yard spatially relate to the dump feature presently eroding into the Laramie River? Based on available photographs, it appears the dump area would have been immediately outside the walls of the



Figure 1.17: View looking west across project area with 1910 canals in foreground (courtesy of American Heritage Center, University of Wyoming, John Hunton collection).

two features, if the dump was in use while these two features were present at the fort (1867-1874). However, if the dump dates from the 1850s to early 1860s, it probably would have been under the east wall, or even within the perimeter of the corral, depending on how much the river bank has eroded. Locating a wall, and especially a corner, of either of these two structures is vitally important for understanding spatial distributions

and relationships of all the Quartermaster Depot buildings and structures. Presently, the locations of these are unknown. Their locations are marked on various maps, but no physical evidence exists on the ground surface. If one structure from the depot is located on the ground, the remainder can then be easily located based on the various

maps. If these two structures, or parts of them, are still present, what danger does the eroding river bank present? If still present, they form a valuable research base for the interpretation of the Quartermaster Corps activities at Fort Laramie and must be protected. This can only be done if either of the two structures can be identified. The main telegraph line to Fort Robinson also ran through the wagon yard, or just west of it. It might be possible to identify this feature as well by the remnants of telegraph poles or other related artifacts.

Likewise, where does the foundation for the 1850s era saw mill lie relative to the dump area? Are there any physical remains left of this feature, or were they all destroyed by the thirty some years of Quartermaster Depot occupation and activities that followed



Figure 1.18: 1868 Native American camp at Fort Laramie. Similar camps were reported north (right) of adobe corral and wagon yard fence seen in background (Steve Fullmer, personal communication 1994) (courtesy of Fort Laramie National Historic Site).

its burning? If still present, what physical remains exist? Does any part of the mill still exist or were all destroyed parts moved away from the fort and dumped? Were all tools picked up and salvaged following the burn, or were some lost during the fire and never recovered? Since the saw mill burned, can this burning be separated from the alleged burnings of the dump recommended by the post surgeon(s) if the two features are superimposed or close spatially?

Subsistence studies

There is little specific information on the day-to-day life of soldiers and other residents of Fort Laramie, other than those activities mandated by the military. Sometimes, even when available, the historic record is unclear

and often contradictory concerning domestic life in western military forts.

Archeological data from the project area may shed light on such questions of subsistence practices. Undiscovered intact dump episodes that have not eroded into the river would likely yield considerable evidence of foodstuffs and consumable goods used by the inhabitants both of the fort and the civilian teamsters. It may be possible to address questions such as comparative reliance on wild versus domesticated animals (one would expect primarily domestic animals) and types of consumable goods imported into the region. Thus, a more complete picture of domestic lifeways than available from historic records or archeological excavations around buildings might be obtained at this

type of dump. Were the teamsters eating different food than the military? Were they drinking different liquids within the fort boundaries than the military? What personal items were they throwing away?

Economic and social structure

One would expect variation in artifact assemblages from residential versus military dumps, particularly between major artifact groups (see Francis 1984), which would be related to ethnicity, household structure and military versus civilian. There also would be variation in kitchen items, clothing, and personal items among all male households; households consisting of a married couple or married couples with children; and the civilian versus military "households." Variation in artifact assemblages also could be related to occupation or business of the residents.

Outlying buildings and dumps may prove most useful for these types of research questions concerning generalizations about differences in economic and social status between ethnic groups, household types, and occupation classes. This would again provide a more complete picture of life at Fort Laramie.

Degree of post-1890 occupation

Fort Laramie was abandoned by the military in 1890. However, ranching and farming activities continued until 1938, when the main portion of the property came under the jurisdiction of the National Park Service. The area north of the fort buildings (e.g., the present project area) did not become part of the National Monument until the 1960s. Additional unrecognized sub-features in the project area might be datable to these time periods. Also, some of these latter dump episodes might be directly superimposed on military dumping episodes. If so, the archeological remains will increase the historical data base for Fort Laramie, particularly for

this farming and livestock occupation of the fort area. Of particular relevance to the homesteading era are, again, the above research questions of subsistence, culture change, and economic and social structure.

CHAPTER 2

PREVIOUS ARCHEOLOGICAL INVESTIGATIONS

by

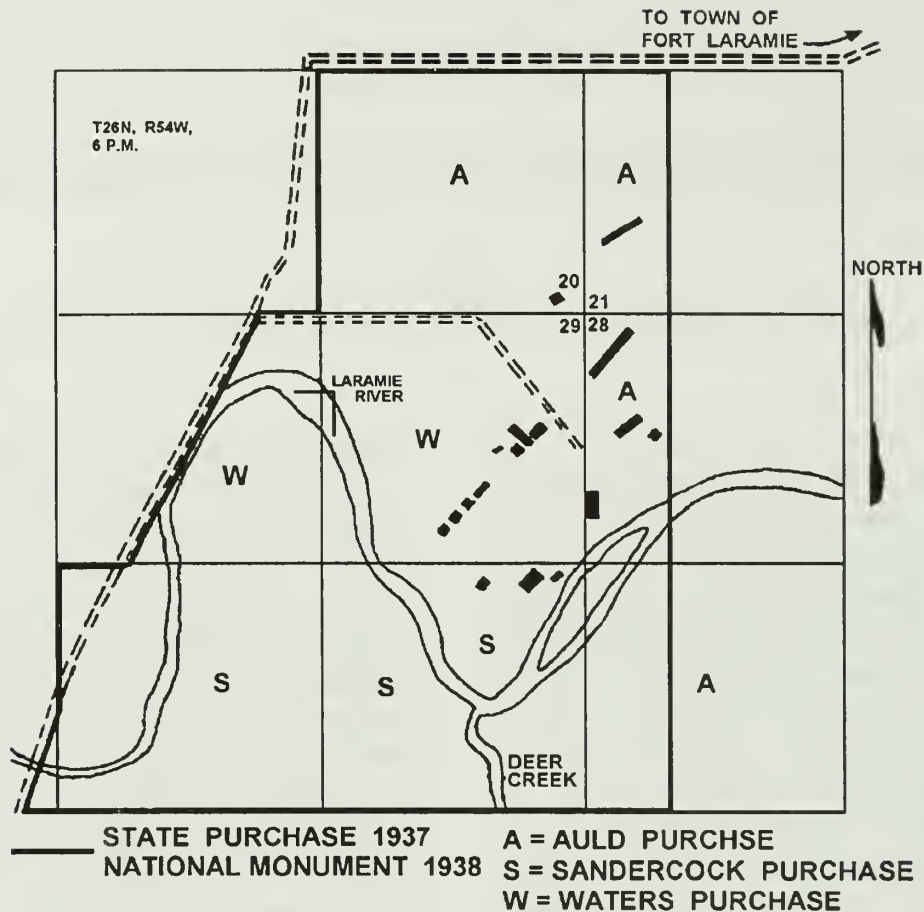
Anne Armstrong, Laura Niven, and Danny N. Walker

Fort Laramie was abandoned by the United States Army in 1890, with the property sold to several civilian ranchers. For the next 47 years, until July 5, 1937, the fort property remained in civilian hands (Mattes 1978). In March 1937, final paperwork was signed for the State of Wyoming to buy the main portion of the fort property from the private owners (Figure 2.1). The property was expanded in 1960 to include the rest of this fort area. The fort was "given" to the United States government on May 3, 1938 and declared to be Fort Laramie National Monument by President Franklin D. Roosevelt on July 16, 1938. Architectural/archeological studies of the fort structures began while the fort was still state property (Mattes 1980:128-129) with a Civilian Conservation Corps project "Topographic and Building Survey of Fort Laramie" between November 29 and December 25, 1937. Other archeological studies soon followed.

A part of the 1994 archeological investigations at the Quartermaster Dump area included a search of the cultural records files at the State Historic Preservation Office. That search revealed both historic and prehistoric materials had been recorded from the property now known as Fort Laramie National Historic Site (Figure 2.2). However, only two archeological projects (Table 2.1) were listed in the files: archeological moni-

toring at the Burt House (Officers Quarters "F") (Scott 1989) and excavations and monitoring at the Cavalry Barracks (Scott et al. 1992). These projects will be discussed below. Two prehistoric sites are recorded (Table 2.2) within the boundaries of the national historic site. 48GO15 consists of several hearths found during irrigation field leveling on the east border of the park, along the confluence of the Laramie and North Platte Rivers (Figure 2.2) (Beaubien 1951c). 48GO17 is also a hearth area, on the south bank of the Laramie River, across from the fort area proper (Figure 2.2) (Husted 1964). We discuss these two prehistoric occupations below. De Vore (1988) reported on a Class III survey of a proposed gravel quarry area reclamation. No cultural resources, either historic or prehistoric, were found during the survey. Other cultural resources on record with the boundaries of Fort Laramie are primarily related to the Oregon/California/Mormon Trail era (Table 2.2). Some later historic sites and structures are also found around the fort property, but away from the present project area. These will not be affected by the present project.

However, many other archeological studies on Fort Laramie have been conducted that do not appear in the SHPO computerized files. These, and the ones mentioned above, will be discussed below in chronological



FORT LARAMIE NATIONAL HISTORIC SITE

1937 LAND PURCHASE AREAS

Figure 2.1: Map showing original property purchased for formation of Fort Laramie National Monument in 1938 (from Mattes 1980).

order. Archeological investigations at Fort Laramie National Monument began in mid-August, 1938 by a CCC work force under the direction of G. Hubert Smith:

Among results of the fortuitous CCC project were vastly improved appearance of the grounds, the first reliable site map to record accurately all identifiable historic features, and preliminary archeology which delineated hidden building sites and laid the groundwork for the area's unique col-

lection of military period artifacts . . . A by-product of the archeological survey was confirmation of the fact that the Monument area excluded over one-half of the 1890 Fort grounds, primarily the Quartermaster and stabling area (Mattes 1980:134)

Smith continued archeological investigations at the fort in 1939 with a small crew of CCC enrollees from Camp Guernsey (Smith 1939). Excavations were undertaken by Smith to obtain archeological information about three building sites during the months

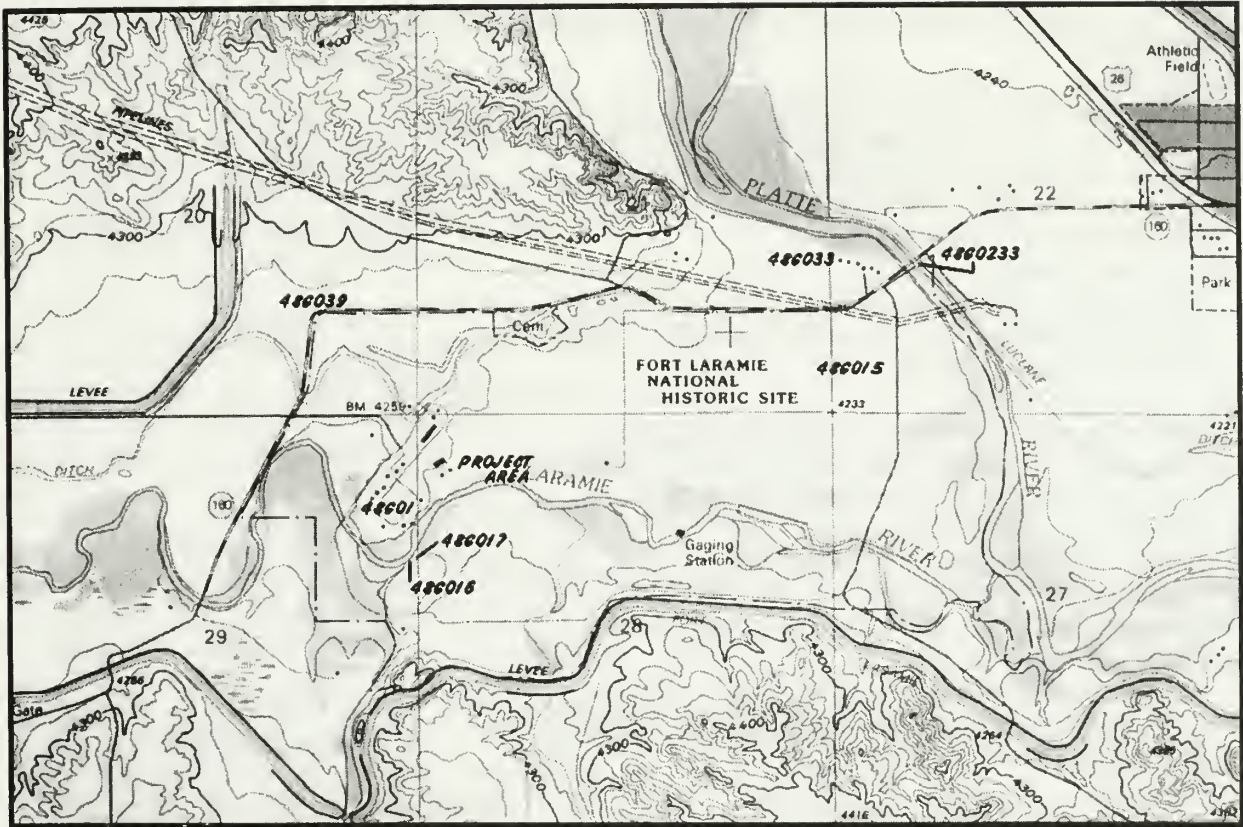


Figure 2.2: Topographic map of Fort Laramie National Historic Site, showing location of various historic and prehistoric sites and features around the fort.

of June, July and August 1939. The buildings investigated were the arsenal, officers' quarters, and the North Infantry barracks. No detailed analyses of all recovered cultural material were ever conducted, but the artifacts remain stored at Fort Laramie today.

Smith's investigation at the arsenal revealed several architectural features, including a possible remodeling for use as an officer's quarters and an addition connecting the structure to the standing rock Powder Magazine. The structure was constructed of adobe bricks, with no formal foundation or footing except on the two front corners facing the parade ground. Most artifact material recovered indicated use of the structure as a domicile and not as an arsenal (Smith 1939:3-6). The Officer's Quarters

excavated by Smith was to the immediate south, between the arsenal and Old Bedlam. This structure was also found to have been constructed of adobe brick, but later modified with lime grout by the army in the 1880s. A fireplace was located, as well as two wings extending to the rear of the structure. Based on construction methods, Smith felt the two wings represented two periods of construction. Smith found evidence for an earlier cellar beneath the wing constructed with lime grout:

... the walls formed, probably, by rough plank of one-inch thickness and of random width, set vertically, but found badly decomposed on excavation. The floor of the cellar was undisturbed fine gravel, the natural deposit

Table 2.1: Cultural Resource Management projects listed on SHPO files, Fort Laramie National Historic Site.

SHPO Accession #: 851034 - Company/Client: NPS

Project name: 1874 CAVALRY BARRACKS/FT LARAMIE

Project type: MITIGATION/MAJOR EXCAVATION

Fieldwork type: EXCAVATION/MONITOR

Survey location: T26N, R64E, Sec. 29

Acres block surveyed: 0

Administrative/Review agency: NPS

No sites/isolates have been recorded in T26N, R64E, Sec. 29 as a result of project 851034-

SHPO Accession #: 880500 - Company/Client: NPS

Project name: QUARRY TRACT 01-128, FORT LARAMIE

Project type: CLASS III INTENSIVE SURVEY

Fieldwork type: MISCELLANEOUS

Survey area shape: BLOCK SURVEY

Fieldwork date: 09/23/88

Survey location: T26N, R64E, Sec. 21, SSNESW

Acres block surveyed: 4

Administrative/Review agency: NPS

No sites/isolates have been recorded in Sec. 21 as a result of project 880500-

SHPO Accession #: 891146 - Company/Client: NPS

Project name: BURT HOUSE MONITOR, FORT LARAMIE

Project type: MONITOR

Fieldwork type: MONITOR

Survey area shape: BLOCK SURVEY

Fieldwork date: 05/09/89

Survey location: T26N, R64E, Sec. 29, SENENENE

Acres block surveyed: 1

Administrative/Review agency: NPS

No sites/isolates have been recorded in T26N, R64E, Sec. 29 as a result of project 891146-

SHPO Accession #: 920117 - Company/Client: NPS

Project name: MANAGEMENT PLAN EIS FT. LARAMIE

Project type: OTHER

Fieldwork type: MISCELLANEOUS

Survey area shape: BLOCK SURVEY

Survey location: T26N, R64E, Sec. 20, SESE

Acres block surveyed: 40

Administrative/Review agency: NPS

No sites/isolates have been recorded in T26N, R64E, Sec. 20, 21, 22, 27, 28, 29 as a result of project 920117-

Table 2.2: Cultural resource sites on file at Wyoming SHPO office, from within boundaries of Fort Laramie National Historic Site.

48GO 1 HISTORIC LISTED ON NRHP REGISTER

Site name: FT LARAMIE

Legal location: T26N, R64E, Sec.29

Recorded by: SMITHSONIAN RIVER BASIN SURVEY

Site type/use: MILITARY FORT

48GO 15 PREHISTORIC NOT ELIGIBLE

Site name: FT LARAMIE-HEARTH S

Legal location: T26N, R64E, Sec. 29 SENENENE

Recorded by: NATIONAL PARK SERVICE

Site type/use: HEARTH, OPEN CAMP, OCCUPATION

48GO 16 HISTORIC ELIGIBILITY UNKNOWN

Site name: WARD-GUERRIER TRADING POST

Legal location: T26N, R64E, Sec. 28 SWSWNW; Sec.29 SESENE

Recorded by: NATIONAL PARK SERVICE

Site type/use: HISTORIC SITE

48GO 17 PREHISTORIC ELIGIBILITY UNKNOWN

Site name: GUERRIER HEARTH

Legal location: T26N, R64E, Sec. 29 NWSWNW

Recorded by: NATIONAL PARK SERVICE

Site type/use: HEARTH, OPEN CAMP, OCCUPATION

48GO 23 HISTORIC ELIGIBLE/CONSULTANT

Site name: CHEYENNE-BLACK HILLS ROAD

Legal location: T26N, R64E, Sec. 21; Sec. 22; Sec. 28 NWNW; Sec. 29

Recorded by: WRC/HISTORIC DIVISION

Site type/use: HISTORIC SITE

48GO 33 HISTORIC ELIGIBILITY UNKNOWN

Site name: FORT PLATTE

Legal location: T26N, R64E, Sec. 21

Recorded by: WRC/HISTORIC DIVISION

Site type/use: HISTORIC SITE

48GO 37 HISTORIC ELIGIBLE/CONSULTANT

Site name: OREGON TRAIL

Legal location: T26N, R64E, Sec. 20; Sec. 27; Sec. 28

Recorded by: WRC/HISTORIC DIVISION

Site type/use: HISTORIC SITE

48GO 39 HISTORIC SEE SITE FORM FOR ELIGIBILITY

Site name: PHILLIP MONUMENT

Legal location: T26N, R64E, Sec. 20

Recorded by: WRC/HISTORIC DIVISION

Site type/use: HISTORIC SITE

Table 2.2 (continued).

| | | |
|---|-----------------|------------------------------------|
| 48GO 161 | HISTORIC | ELIGIBILITY UNKNOWN |
| Site name: FORT WILLIAM | | |
| Legal location: T26N, R64E, Sec. 21 SESE | | |
| Recorded by: WRC/HISTORIC DIVISION | | |
| Site type/use: HISTORIC SITE | | |
| 48GO 164 | HISTORIC | ELIGIBLE/CONSULTANT |
| Site name: CHILDS ROUTE-OREGON TRAIL | | |
| Legal location: T26N, R64E, Sec. 22 | | |
| Recorded by: WRC/HISTORIC DIVISION | | |
| Site type/use: HISTORIC SITE | | |
| 48GO 166 | HISTORIC | ELIGIBLE/CONSULTANT |
| Site name: MORMON TRAIL | | |
| Legal location: T26N, R64E, Sec. 22; Sec. 27 NWNW | | |
| Recorded by: WRC/HISTORIC DIVISION | | |
| Site type/use: HISTORIC SITE | | |
| 48GO 233 | HISTORIC | ELIGIBLE/CONSULTANT |
| Site name: FT. LARAMIE BRIDGE | | |
| Legal location: T26N, R64E, Sec. 21 SW | | |
| Recorded by: WRC/HISTORIC DIVISION | | |
| Site type/use: TRANSPORTATION BRIDGE | | |
| 48GO 264 | HISTORIC | ELIGIBLE (SHPO CONCURRENCE) |
| Site name: FORT LARAMIE CANAL | | |
| Legal location: T26N, R64E, Sec. 20 WWWNE/WWNWSE/NWNWSW-SE/SESW/SSWSW; Sec. 27 NWSW/SNESW/NESESW/NWSWSE/SE-NWSE/SNESW/NNENESE; Sec. 28 NSW/SESESENW/SSSNE; Sec. 29 NSW/SWNESE/SSE/SNESE | | |
| Recorded by: WYOMING STATE ARCHEOLOGIST OFFICE | | |
| Site type/use: IRRIGATION CANAL | | |

encountered at that depth. That this feature was a cellar (rather than a latrine pit) was clear from the presence of the remains of a runway, or ramp, leading from the lower area toward the building proper, with which it was doubtless [sic] related, and upon which steps had been placed, and the fact that the area had been completely filled with clean gravel, free of any cultural debris, when its use was discontinued. It should also be note [sic] that at that

time certain timbers (approximately 6" by 6") were set on end in the cellar to provide footing for the later grout foundation, which was placed partly over the abandoned cellar (Smith 1939:8).

Smith also found a concentration of artifact material next to and north of the grout wing and just below the ground surface. Smith felt this scattering was probably the remains of a trash heap left when the

structure was abandoned. It contained glassware and tinned containers of recent types and was not within any sort of pit. Based on artifact types, Smith felt the material post-dated the military occupation.

The last structure investigated by Smith in 1939 was the enlisted men's barracks on the north end of the parade ground. While the structure was apparently of frame construction, Smith excavated limestone and sandstone foundations laid in lime mortar. Areas of the foundation appeared to have been deliberately removed. Chimney foundations were found in several areas running down the center of the structure. Two cellars were found near the center and east end of the barracks, beneath the rear of the structure. These were walled with horizontal planks held in place by vertical timbers. Both had a dry laid brick floor, but were

filled with clean gravel and sand. Smith thought both cellars were probably in use during the earliest years of the fort's military occupation, and filled before later construction of the central and west portions of the barracks. A large quantity of artifacts was found during excavations of the barracks, including material of personal, military, and domestic articles.

Excavation was undertaken in the fall of 1940 on Officers' Quarters D and the Sutler's Store (Hendron 1941). The report is one of few that discuss details about artifacts recovered in the excavations. Hendron found evidence the original structure at Officers Quarters D (Figure 2.3) was constructed of mud adobe bricks and consisted of two rooms separated by an adobe wall. The inside walls were plastered with lime. Plank floors were found in the rooms, as



Figure 2.3: Archeological excavations behind Quarter's "D" (from Hendron 1941).

were adobe chimneys that may have been converted to contain tin flues. Additional rooms were later built to the rear of this adobe structure. To the rear of these rooms, Hendron found two cellars with simple basement stairs. These cellars were also lined with wood planks. Three outhouse pits were located southwest of the building. One of these was cribbed and the other two were not. Artifacts recovered from Quarters "D"

ranged in age from 1855 to a 1925 automobile license plate. Most military artifacts could not be dated. Officers' insignia were recovered, along with several medical type items. Women's artifacts and children's toys were also recovered. Many bottles were recovered, primarily from the outhouse pits in the back of the building. These bottles were from a variety of sources, including imported alcoholic spirits.

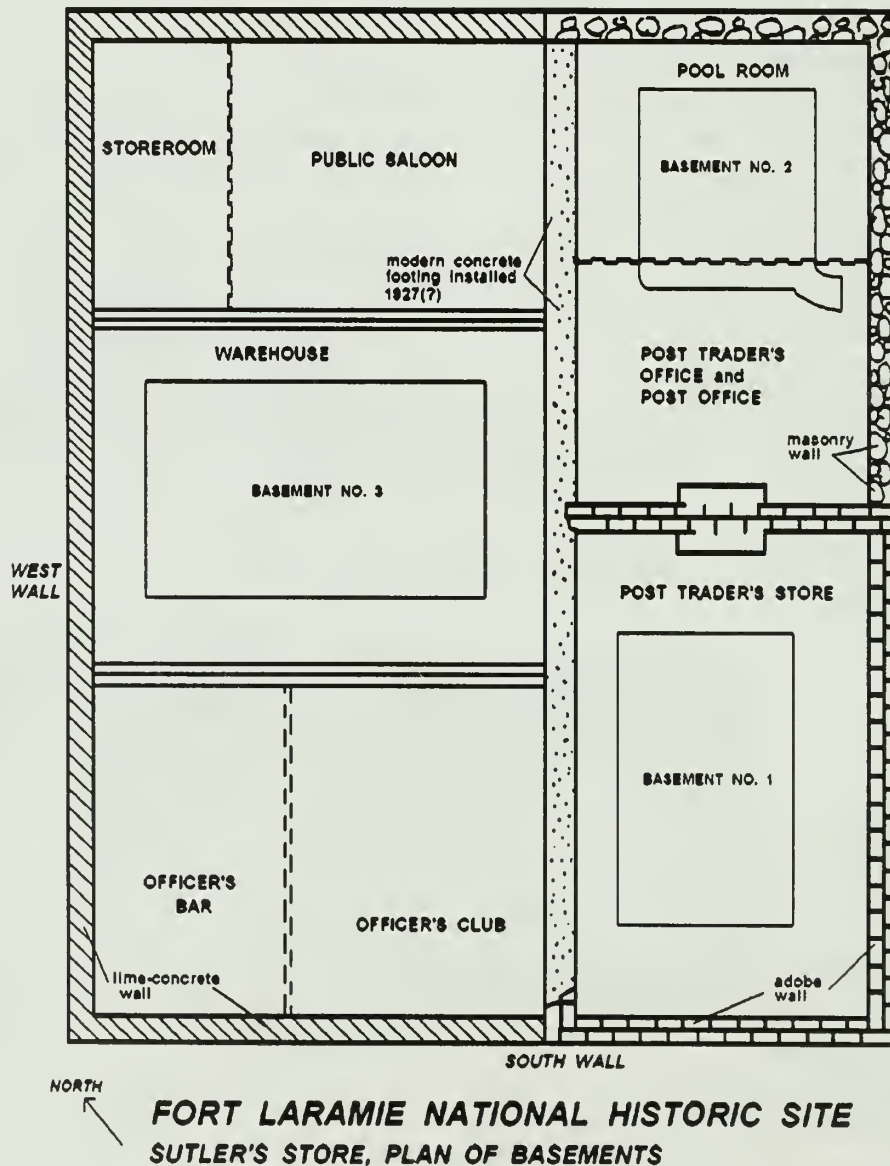


Figure 2.4: Plan view of basements, Post Sutler's Store (from Beaubien 1951a).

Hendron (1941) also investigated a cellar beneath the Sutler's Store (Figure 2.4). There are three cellars, but Hendron only excavated the one directly below the trader's store. Hendron could not determine if the cellar was originally dug at the time the structure was built or later. The cellar was placed below the center of the room, with the entrance said to be near the northeast wall. Some possible evidence for a stairway into the cellar in this area existed, but no positive evidence for any type of flooring. Wood planks may have been laid on the floor to keep specific items from the dirt. While few artifact types were found, many artifacts that could be directly related to the sutler's activities were recovered, including trade tokens and coins. Trade beads and a large series of broken clay pipes also indicate standard items for a trading post. Hendron argued that the cellar served as a refuse for lost and broken items over a period of years.

Beaubien also made an emergency trip to the fort in 1949 (Figure 2.5) when foundation work at the Old Bakery revealed artifacts and two features. One corner of the building had collapsed and a new foundation footing was being installed. Two refuse pits were located under the collapsed wall.

The demarcation of Pit A, just to the north of the mid portion of the wall . . . was quite distinct. The pit was 67 inches long, 52 inches wide, and the floor was 32 inches below the bottom of the old foundation. Pit B was under the northwest corner which had settled a full 12 inches. The earth in the vicinity of the pit had been disturbed, and the outlines of three sides of the pit were not located definitely until our excavation had reached a point some 24 inches below the bottom of the footing. The north and south walls were fairly distinct, but the west wall

of pit had sloughed off years ago when the pit was open. The east wall of the pit was not determined, as we did not wish to excavate too close to the remaining wall. The floor of Pit B was found on the level of river sand and gravel, 63 inches below the bottom of the original foundation (Beaubien 1949:1).

In removing and screening the fill, considerable cultural debris was recovered, including the following: more than a dozen whole bottles and numerous fragments of others, several pieces of dishes, two pitch forks with two broken tines each, a badly rusted curry comb, an axe head . . . a small hammer head, numerous square nails of various sizes, a large metal tripod of undetermined purpose, a few metal objects unidentifiable through encrustations of rust, a very few harness fittings, a bone handled knife, numerous animal bones, a few scraps of leather and cloth, the remnants of several shoes, portions of two billfolds, some charcoal, and a considerable quantity of rotted wood (Beaubien 1949:1).

While excavations were limited, it appears the two pits contained a variety of artifacts. Artifacts recovered from the Old Bakery were not analyzed, but boxed and placed in storage for later analysis and possible display.

The following year, during the months of September through November 1950, Beaubien excavated basements 2 and 3 of the Sutler's Store, a small portion of the old cemetery next to the New Hospital foundation, and exploratory trenches in hopes of finding the foundations of Fort John on the west end of the parade ground (Beaubien 1951a). These were some of the more extensive excavations to date, especially those exploring for Fort John.

Beaubien began his work in Basement 2



Figure 2.5: Features found at the Old Bakery. Pit A is in the foreground, while Pit B has the line rod marking the northwest corner of the building (from Beaubien 1951b).

of the Sutler's Store (Figure 2.4), located under the Enlisted Men's Bar pool room area. The basement was around 6.5 feet deep originally. The west wall of the basement had a remnant of a dry-laid masonry wall (Figure 2.6). The floor was originally covered by a wood floor, found to be highly deteriorated during the archeological investigations. Unlike other basements and cellars

excavated earlier, this one had a vertical ladder as the access method that was still in place at the beginning of the archeological excavations. Artifacts recovered included bottles, ink bottles, vanilla extract bottles, buttons, sealing wax, slate pencils, steel pin tips and holders, toothbrush handles, cartridges, coins dating between 1836 and 1887, and ceramic pipes.

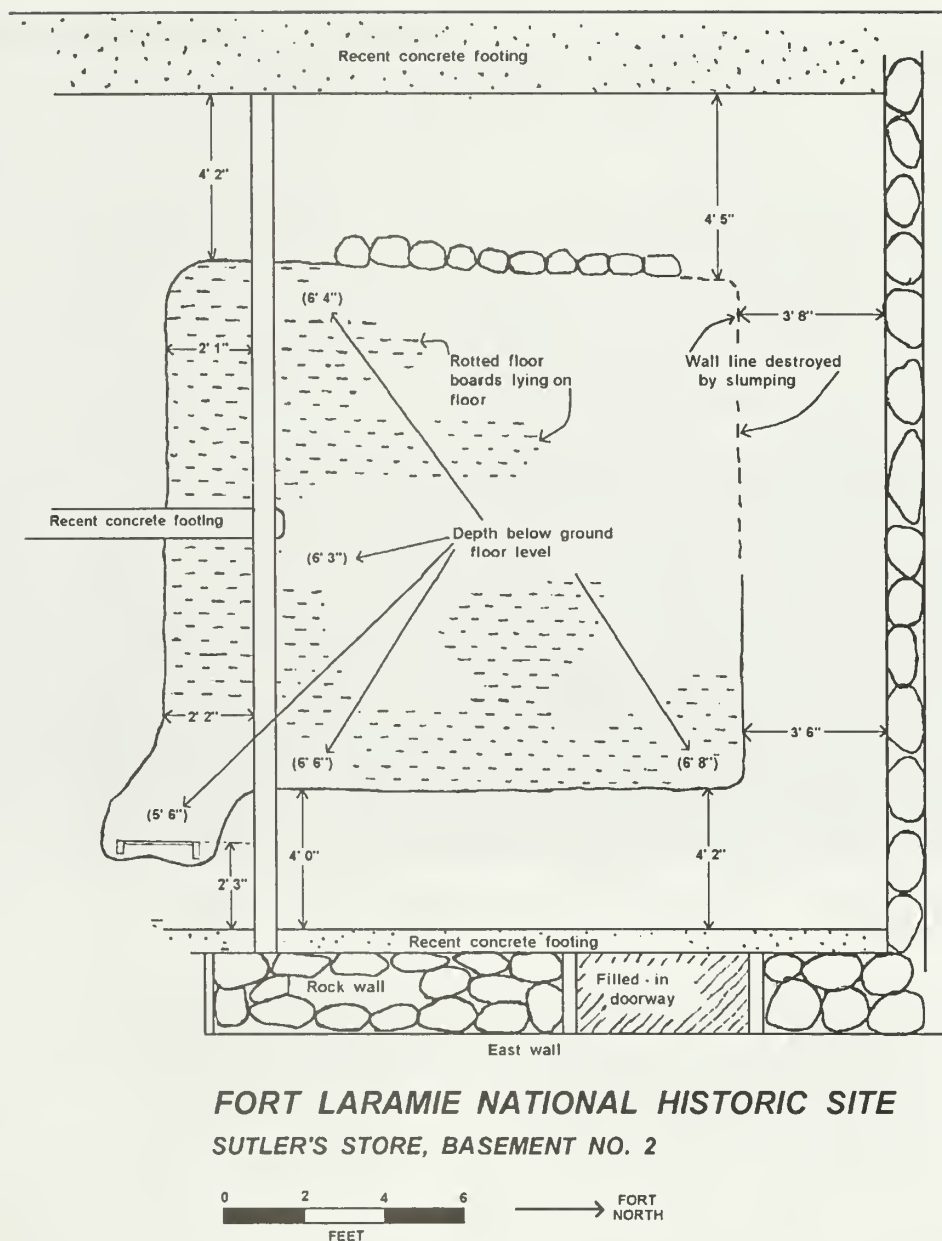
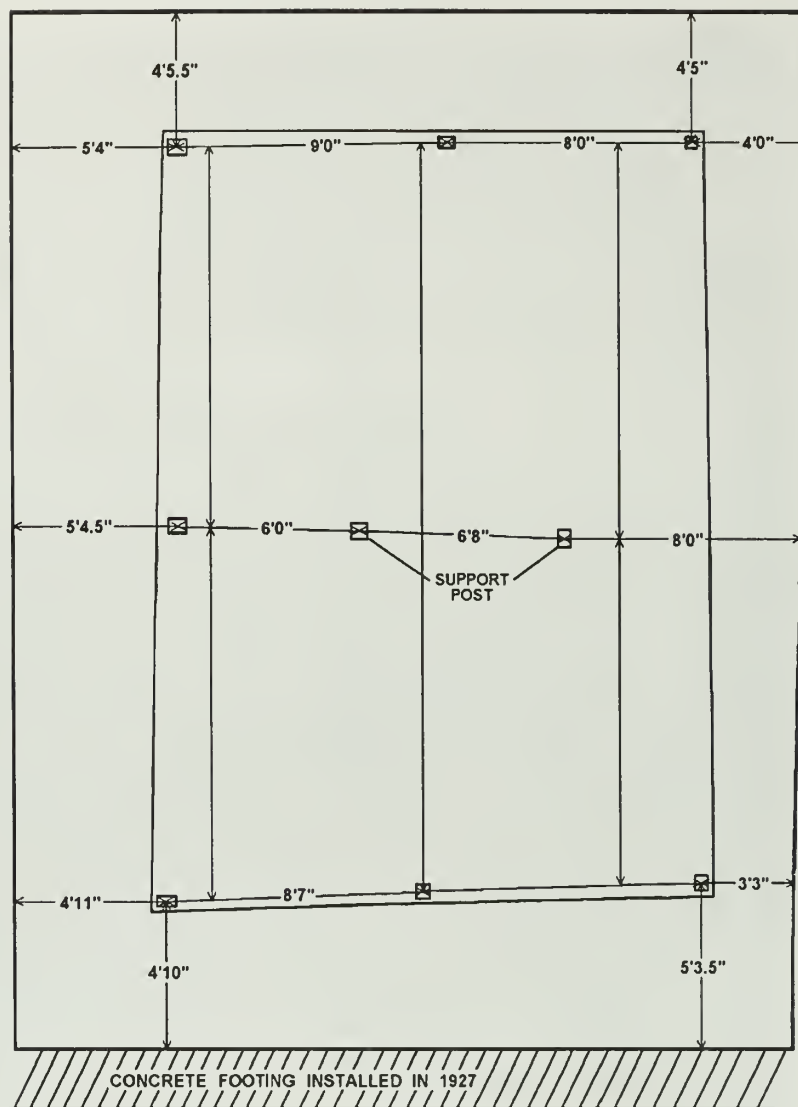


Figure 2.6: Plan view of Sutler's Store Basement No. 2, showing area covered by wooden floor (from Beaubien 1951a).

Basement 3 lay directly under the warehouse area on the west side of the Sutler's Store (Figure 2.4). This was a larger basement that was up to eight feet deep. No wooden floor was found, but a large amount of artifact material marked the floor of the basement. Nine posts had been placed in the

cellar to support the warehouse floor above (Figure 2.7). Rainwater had undercut the south wall of the warehouse, damaging the store foundation and south wall of the cellar (Figure 2.8). Apparently, a phenomenal amount of artifact material was recovered from the basement excavations, including



FORT LARAMIE NATIONAL HISTORIC SITE

SUTLER'S STORE, BASEMENT NO. 3

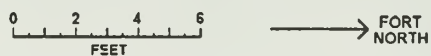


Figure 2.7: Plan view of Sutler's Store Basement No. 3, showing location of wood posts supporting floor of Sutler's Warehouse room above (from Beaubien 1951a).

many wooden shipping containers, still with readable labels, hatchets, corks, bottle seals, bottles, pencils, flat, round, and triangular files, earrings, cufflinks, bullets, cartridges, and percussion caps, scale weights, sack needles, horseshoe nails, and

. . . model "T" car parts; Communistic literature; corn cobs and kernels; beans; peach and plum pits; hulls of Brazil nuts, hazel nuts, walnuts, and peanuts; potato vines; sugar beet tops; fragments of cloth; harness parts; pieces of rope; a few dish fragments; numerous portions of lamp chimneys



Figure 2.8: View toward southwest corner of Basement No. 3 before excavation. Footing under south wall of warehouse is exposed and partly undercut. Note evidence of flowing water (from Beaubien 1951a).

and shades; some broken glass jars as well as innumerable bottle fragments; a number of small pieces of copper sheeting; pieces of copper wire; many pounds of cut nails; numerous pieces of wire; some screws, rivets, and staples; chewing tobacco labels (Climax, Spark Plug, Horseshoe); door knobs; marbles; etc. . . . Bottles and corks, with the material used to pack bottles, were so numerous that it was quite evident this cellar had important use for storing beverages. Evidence of heavy pieces of lumber were found along the west side in position support barrels, laid horizontally, at a height barely sufficient to permit withdrawing the contents through faucets (Baubien 1951a:15-16).

Excavations were also conducted around the base of the New Hospital, near where the old cemetery was placed. A five foot wide trench was excavated from the edge of the terrace, where a Folsom point had been found, to within a few feet of the Hospital foundation (Figure 2.9). Only limited evidence for prehistoric occupation was found. However, excavators located several graves from the old cemetery (Figure 2.10). Two of these graves were excavated and the positions of the other three were noted only by soil color changes similar to the excavated graves. Grave No. 1 was 3'3" wide, 7'9" long and exactly six feet deep. No coffin was found, and all cloth had deteriorated. Based on skull characteristics, the grave

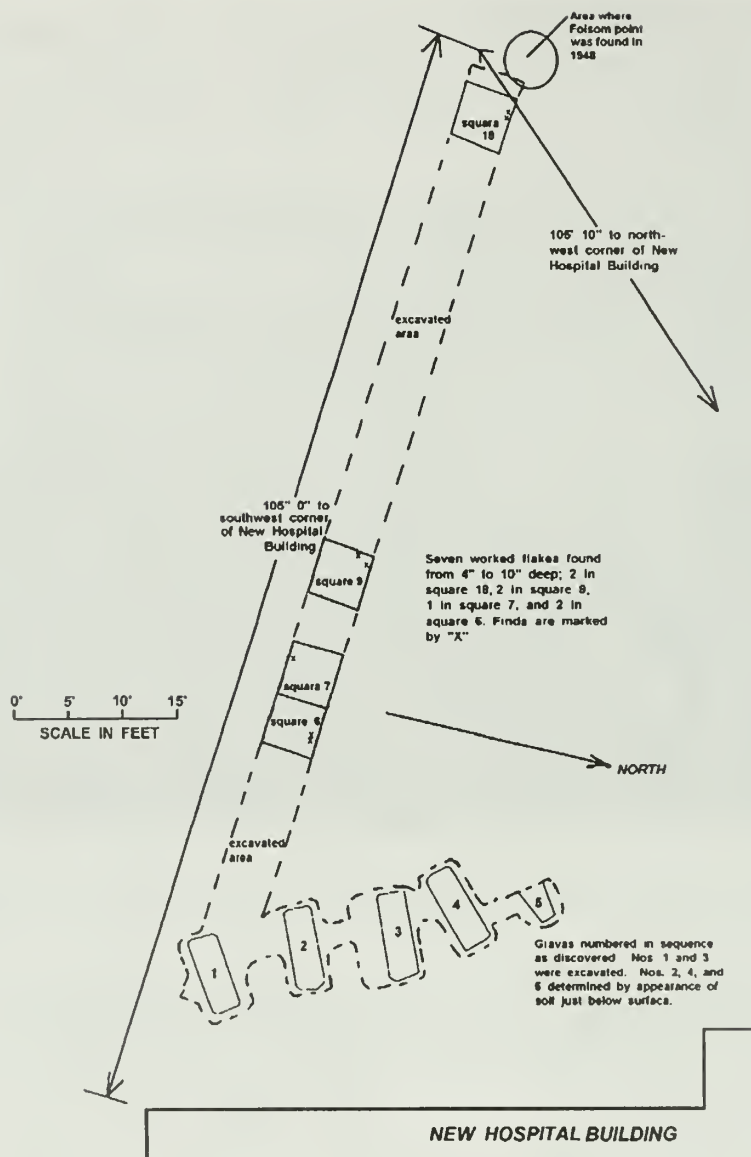


Figure 2.9: Plan map showing excavation trench in old cemetery area, including locations of five graves (from Beaubien 1951).

contained a 45 year old adult male. Grave No. 3 also was fully excavated and contained, again, a male between 40 and 45 years of age in a rotted wooden coffin. No shoes were found, but evidence of cloth was found the entire length of the skeleton. Both graves were refilled after the excavations, leaving the skeletons in place.

The last area excavated by Beaubien in 1950 was the area around the site of the original Fort John, on the west end of the parade ground (Figure 2.11). The army demolished this large structure (121 by 167 feet) in 1854. The structure appears on the 1851 map of the fort (see Woods, this volume) so Beaubien knew its location. Al-



Figure 2.10: Grave No. 1 after excavation. The shoes and six buttons were the only items noted as accompanying the bones (from Beaubien 1951a).

though an exploratory trench was excavated north across the postulated location (Figure 2.12), no positive evidence for Fort John was found. However, several features associated with the later occupation of the fort were located, including a previously excavated trench (Figure 2.11), a series of post holes and a large pit (Figures 2.12, 2.13, 2.14), and remnants of at least three building foundations (Figures 2.11, 2.15, 2.16). The reason for the previously excavated trench that contained no artifacts was not known. The large pit was thought to have been originally excavated for an outhouse that appears on the 1871 map in this approximate location, and was probably associated with Officers Quarters "B" directly to the north.

Many artifacts came from this pit, including bottles (of various sizes and use), ceramic plates and other vessels, glassware, bowls, brush handles, combs, buttons, a dental plate, and children's toys. Except in areas where photographs showed backyard fences, it appeared to Beaubien that the topsoil over much of this area had been removed during the earlier military or ranching occupations. Metal detecting over the area (Figure 2.17) did not show any large area of metal that would have been left over from the Fort John blacksmith shop, although tin cans as deep as eight inches were found.

The first structure to be found was part of Building 65 (Figures 2.11, 2.16), on the west side of the excavation area. Other than

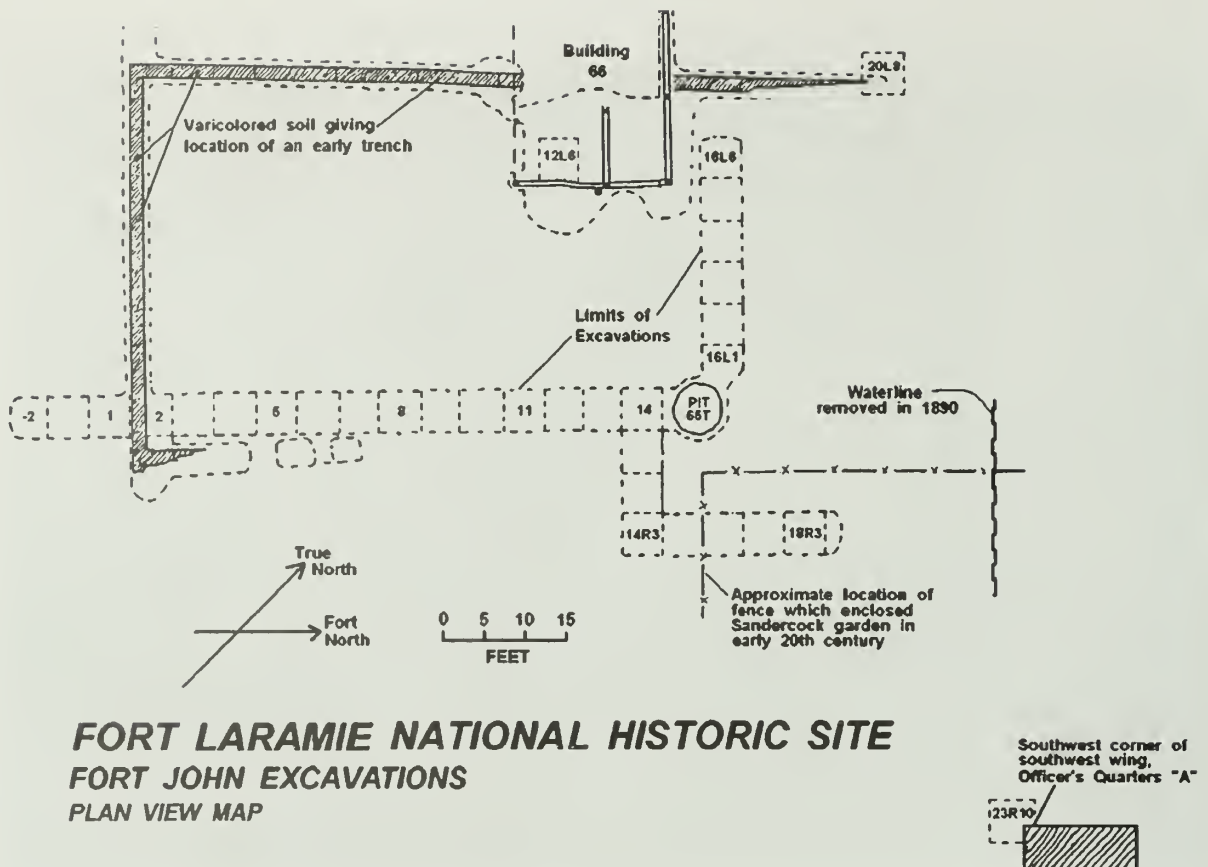


Figure 2.11: Plan view of Fort John excavation area, showing original archeology trench, earlier trench, and Building 66 (from Beaubien 1951a).

locating the edge of the building, no further investigations into the structure were made. A trench dug from the southwest corner of the Adjutants office revealed a filled-in trench thirty-eight inches wide and 22 feet long (Figure 2.15). Beaubien thought this might be the foundation for a heavy wall; if so, it would have been Fort John, but no substantiating evidence exists.

The series of postholes (Figures 2.11, 2.12), indicating a small wood building (Building 66), was thought to be a woodshed. In the southeast portion of the area covered by this structure, a large number of artifacts were recovered. These dated to around 1850, or when Fort John would have still been standing. The artifacts included

trade beads, bone buttons, percussion caps, trade bells, brass earrings, gun flints, lead bullets and some prehistoric lithic and bone artifact material. Beaubien argued the area around Building 66 had been leveled before construction, thus destroying most evidence of Fort John, if any even existed then.

Baubien returned to Fort Laramie in June of 1951 to conduct salvage efforts during earth disturbance and rehabilitation efforts at the Sutler's Store (Baubien 1951b, 1953). A large quantity of artifact materials was salvaged from the construction area:

To give some idea of the type and number of artifacts recovered during June, I submit the following list, as



Figure 2.12: View, looking south, of main excavation area at Fort John. Officer's Quarter's "A" in background. Three check marks indicate post holes in squares 11, 12, and 14. Shovel marks pit 65T (from Beaubien 1951a).

recalled from memory: about 400 trade beads from three different outdoor sources; 2 butcher knives with wooden handles and 1 bone handled pocket knife; about 12 ax and hatchet heads; about 12 whole bottles, including 3 or 4 types new to the collections; a gunlock for an old springfield; 1 pistol flint; 10 coins; 2 scale weights; portions of several types of drinking glass; numerous cartridge cases; a few lead bullets; 2 ox yoke clevises; portions of door locks and window catches; several hinges; several harness parts; irons for 2 or 3 singletrees; 3 ox shoes; a kerosene lamp burner; and a glass fountain of a kerosene lamp; several odd pieces of chain; 2 or 3 complete

brass faucets and portions of 2 or 3 others; several woodworking tools such as wood boring bits and chisels; some pieces of clay pipes; a few pieces of printer's type; a few buttons, both military and civilian; portions of a few dishes; about one-half of a china doll's head made in Germany; a whetstone; a portion of a billiard ball; one of the small wooden counters used in marking up a billiard score; and 2 or 3 poker chips. Perhaps the most important item for exhibit purposes was an enlisted man's shoulder scale (Baubien 1951b:1-2).

Baubien also noted the exposure of several structural items:

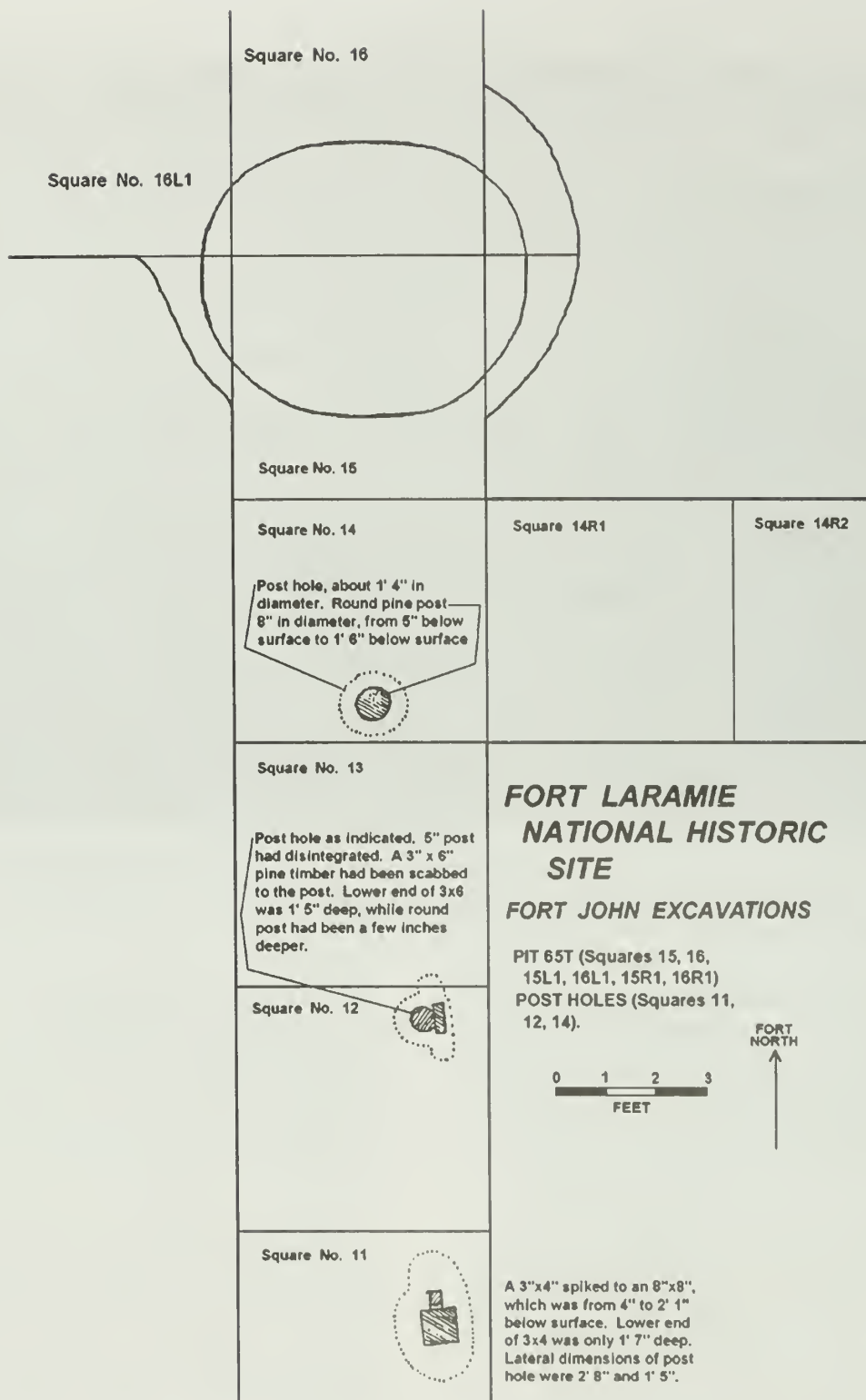


Figure 2.13: Detail of Fort John excavation area plan view map, showing location of postholes and postulated outhouse pit (from Beaubien 1951a).



Figure 2.14: Postulated outhouse pit excavated at Fort John area, showing in situ artifacts and pit outline (from Beaubien 1951a).

Among the structural features encountered were the three sills and one floor joist of a frame building extending under the officer's bar; the remains of the bottom logs of three sides of a log room; a number of 6 x 6 floor joists of another room only partly excavated; a portion of another large log indicative of another log storage room; a brick structure which may represent the remains of a corner fireplace; and portions of three palisade fences (Baubien 1951b:2).

Baubien (1953) recorded the structural features found in 1951 in a series of photographs and plan view maps. No other de-

tailed report on the 1951 excavations has been prepared. Excavations conducted on the west side of the Sutler's store revealed a series of earlier structures (Figure 2.18, 2.19), and two series of postholes postulated to be the remnants of a palisade (Figure 2.18, 2.20). Excavations on the south wall primarily revealed a series of fence posts between the Sutler's Store and Officer's Quarters "F," or the Burt House (Figure 2.18, 2.19). Based on the excavation map, it appears Beaubien almost completely excavated the area between these two structures. More limited excavations on the north side of the Sutler's Store (Figure 2.22) also revealed a series of postholes, probably to support an

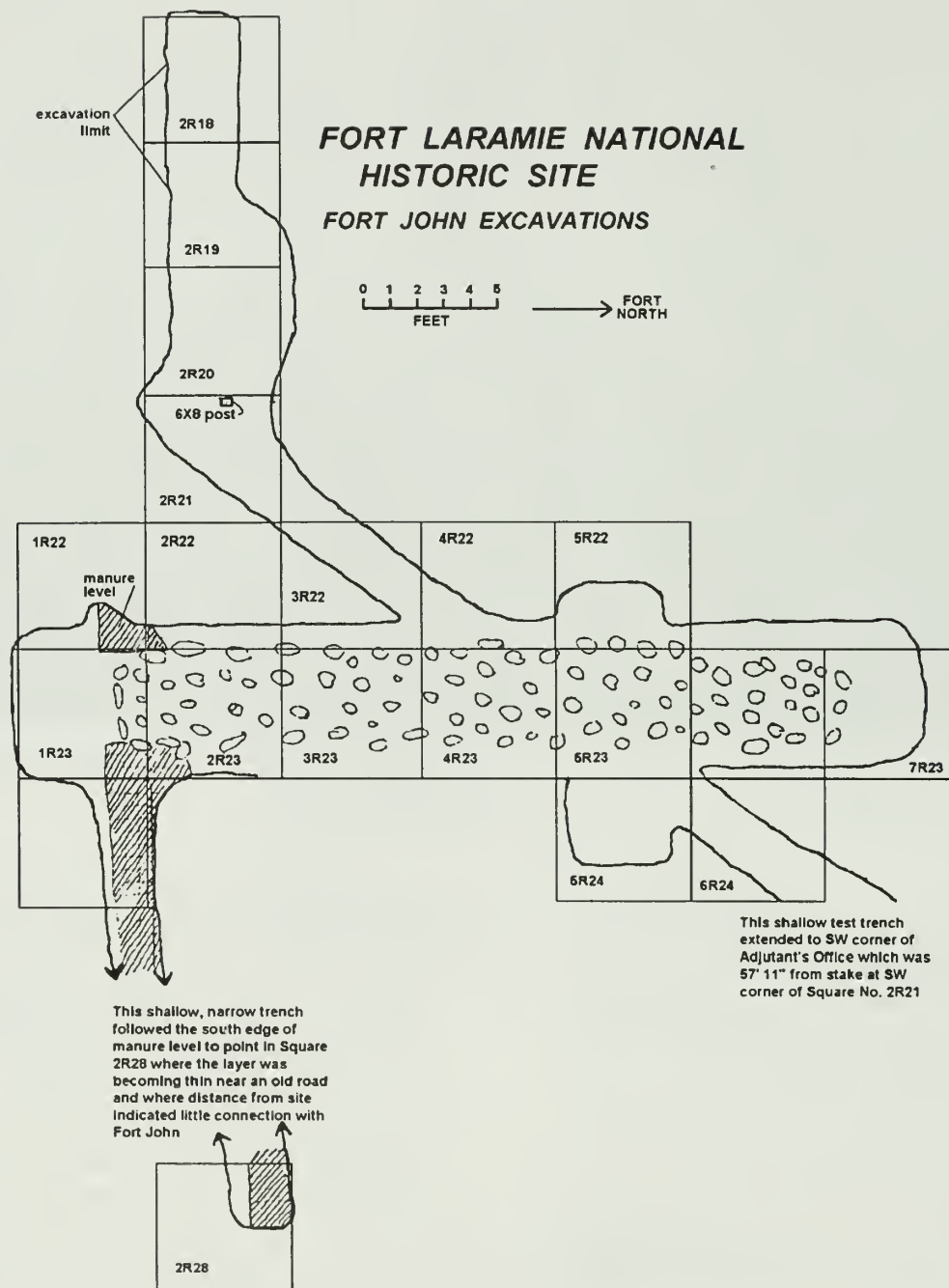


Figure 2.15: Detail of Fort John excavation area, showing location of filled-in trench, possibly a foundation (from Beaubien 1951a).

**FORT LARAMIE
NATIONAL
HISTORIC SITE**

**FORT JOHN
EXCAVATIONS**

SQUARES 26L11, 26L10,
27L10, 27L9, 28L10

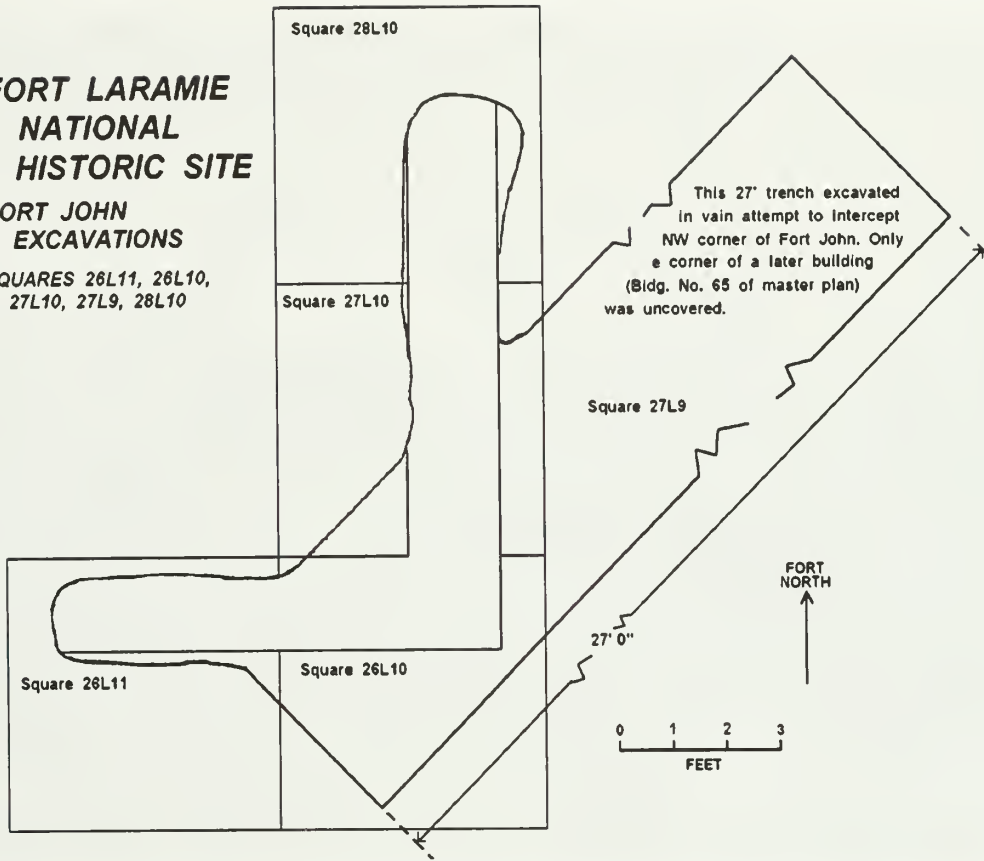


Figure 2.16: Foundation corner of Building 65 recorded during Fort John excavations (from Beaubien 1951a).

earlier structure and a large (over five feet in diameter) well pit in what is now the northwest corner of the standing structure.

Beaubien also monitored sewer trench excavations on the east side of the Cavalry Barracks.

... A three-fourths-inch pipeline and a two-inch one were uncovered in this trench. These were photographed and mapped. It appears that a trench anywhere on the monument might bright to light additional historic features (Beaubien 1951b:2).

Beaubien returned to the Fort in October 1951 to conduct monitoring and salvage operations following a land leveling opera-

tion one mile east of the fort area (Beaubien 1951c). Beaubien monitored the field leveling that Herman Nolke was doing on the area where Ft. William was thought to have been located. The leveling (Figure 2.23) did not reveal any evidence of Ft. William, although over a dozen prehistoric (or early historic?) firehearth were located and recorded (Figure 2.24). These were later assigned 48GO15 for a site number. Beaubien did not think the location would have been practical for Fort William:

Local residents were of the opinion that the supposed site was frequently subject to flooding before so much water was diverted from the Laramie and North Platte Rivers for irrigation purpos-



Figure 2.17: Metal detecting at Fort John in 1950. This was the first instance recorded on use of metal detectors in the history of Wyoming archeology (from Beaubien 1951a).

es. I do not believe that Fort William ever occupied a site along the present river bank near the Nolke field, but it is possible that there was once slightly higher ground in the vicinity which has been undercut and removed by the Laramie River since the abandonment of the stockade (Beaubien 1951c:2).

McNutt (1958) describes excavations in and around Old Bedlam (Figure 2.25) that were conducted in hopes that archeological work would contribute information pertinent to the restoration and reconstruction of Old Bedlam. Old Bedlam was one of the first buildings constructed by the military after taking over Fort Laramie in 1849 and is the

only standing structure left from that period of occupation. This was originally a two-story frame building with stone foundations. There were side wings on the north and south ends, and front and back porches added later to the structure. In 1881, the side wings and porches were removed and a rear kitchen wing added. For most of its history, Old Bedlam served as an officer's quarters.

Excavations centered on the two wing foundations, which were still visible, and the back porch foundation. The entire area within the south wing foundation was excavated, as well as an area two feet outside the foundation wall. A fireplace foundation was found along the rear wall of the south wing.

FORT LARAMIE NATIONAL HISTORIC SITE **AREA EXCAVATED WEST OF SUTLER'S STORE, 1951**

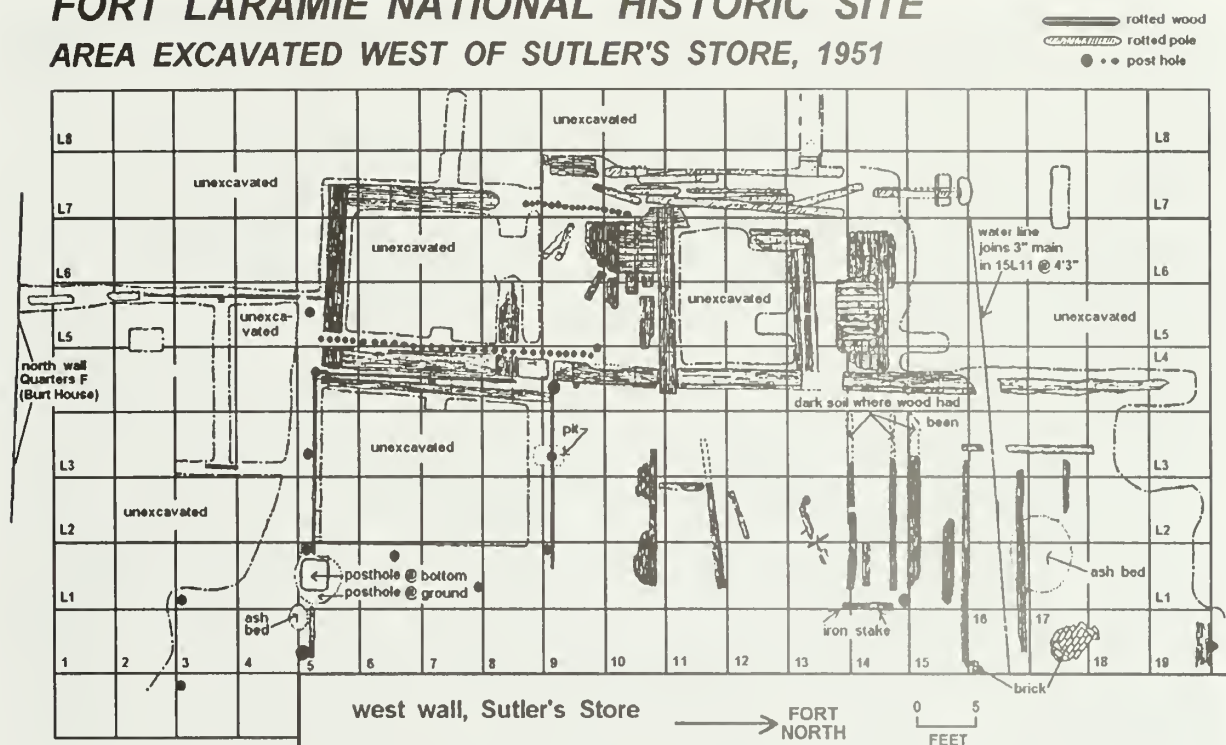


Figure 2.18: Plan view map of excavated area west of Sutler's Store. Note postulated two rows of palisade postholes and various remains of other wood structures (from Beaubien (1953).

A small outbuilding was found just behind the south wing, but its purpose could not be determined. Because of post-military ground disturbance, excavations in the north wing area were not as extensive. Only a series of trenches were excavated. A large excavated trash pit (Figure 2.25) was found to have almost destroyed the back wall of the foundation. Portions of the remaining foundation suggested a similar construction and appearance to the south wing foundations. The trash pit (Figure 2.26) found in the north wing area measured between 19 and 26 feet in diameter, with irregular sides. It was at least 5.8 feet deep. Most artifacts recovered from the north wing excavations were found within a concentrated zone in this pit.

Excavations also occurred within the rear

kitchen wing, to find the foundations of the original rear porch. The rear wing foundations were made from lime grout, not the large sandstone blocks found in the north and south wing foundations, and were shallow compared with the wing foundations. Few artifacts were found in the rear wing excavations. Beaubien traced out the back porch foundations, but these were not excavated to their base (Figure 2.25). These foundations were similar to the north and south wing foundations.

Most artifacts recovered were felt to date after the military occupation of Fort Laramie, because they came from the large trash pit northwest of the structure. Those few artifacts found within the foundation were related to military activities. Found within



Figure 2.19: Remnants of wood structure found during excavations on west side of Sutler's Store (from Beaubien 1953).

Old Bedlam's building foundation were bottles, pattern and window glass, beads, ceramics, metal (including nails, screws, wire, coins and wagon parts), stone, bone, grout, and plaster. Specimens found outside the foundation consisted of bottle and window glass, ceramics (several colors), fragments of a doll's hand, metal (including nails, screws, wire, cartridges, bullets, tin cans, gun parts, buttons, door lock and hinge pieces), stone, bone (including manufactured items such as toothbrush handles), shell, leather, grout and plaster and other miscellaneous items. Most artifacts from the trash pit date to the 20th century, although the lowest material may be military related. In

general, they included glass, ceramic, metal, bone, cartridges, harness buckles, clay pipes, plastic combs, buckets, buttons, and several construction related items. Bottles from the trash pit included beverage, liniment, condiment, extract, flavoring, and medicine bottles.

In 1958, water mains and fire hydrants were installed at Fort Laramie. The trenches for these pipelines were monitored (Figures 2.27, 2.28), and rerouted if structural remains were found.

No subterranean historic buildings were identified as such along the pipe line route although evidences [sic] of build-



Figure 2.20: Excavated area west of Sutler's Store. Small upright stakes mark locations of some postholes found in Square 6L6 (from Beaubien 1953).

ing activity were found. These evidences were noted and the pipe line changes resulted which avoided such evidences (Ringebach 1958a:2).

Beginning at the Laramie river crossing site and moving northward the first archeological evidences [sic] encountered were at the bend turning west toward the Officer's Quarters "A" and near the site called the Library 1885. These evidences [sic] consisted of ash, metal and glass fragments, charred wood fragments and were presumed to be discard or fill -- no evidence of building foundation were construed. Turning northward from the SE corner of the parade ground and running out the line several rotted wood post stubs

were encountered similar to those shown . . . these located in front of the New Guardhouse. The drain line was clean. At different locations on the line fronting Officer's Row various metal and glass fragments and ash and charred wood were encountered. No definite pattern was involved and these were presumed discard (Ringebach 1958b:1).

Because much of this line was around the parade ground, or in other areas where no structural remains were known to be, there was little impact on the archeology of Fort Laramie by this project.

Gann (1960) reported on archeological salvage operations that were conducted

FORT LARAMIE NATIONAL HISTORIC SITE

1951 SUTLER'S STORE EXCAVATIONS NORTH WALL AREA

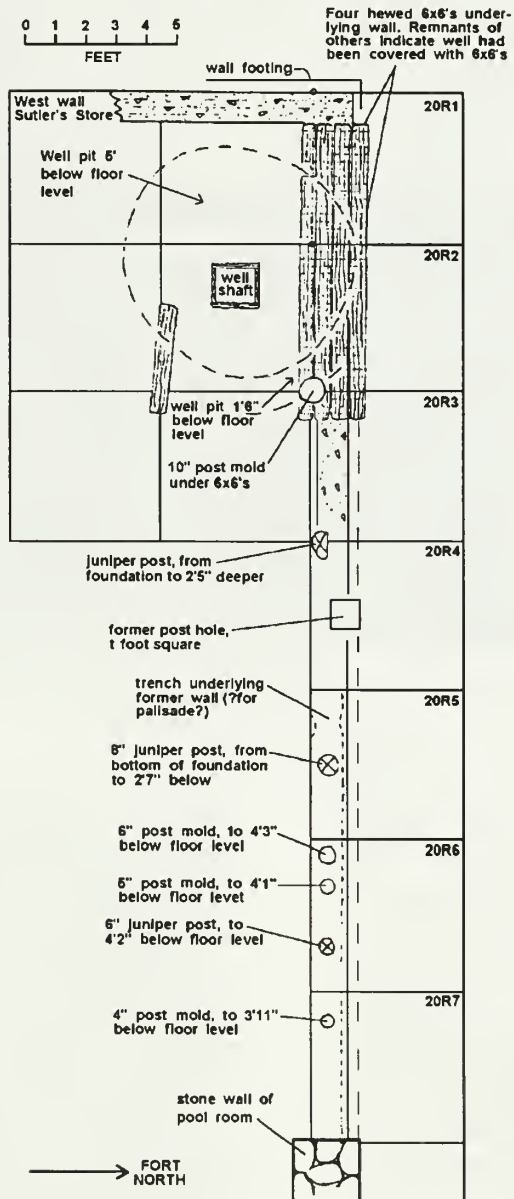


Figure 2.22: Plan view map of excavation area on north side of Sutler's Store. Note series of postholes under foundation and location of well shaft and pit (from Beaubien 1953).



Figure 2.23: 1951 Land-leveling operations one mile east of Fort Laramie near one area felt to be site of Fort William. Note extensive ground disturbance (from Beaubien 1951c).

during the 1960 stabilization of the Sawmill.

At several places around the foundation excavations along the foundation were made to their full depth below grade. This depth being to ascertain their state of preservation. No artifacts or structural members of significance were found in this excavating and cleaning. It appears that at the time the Army abandoned the fort much of this structure was removed. Since the building had only been built some three or four years previously, the equipment connected with this building--boiler, flue stack, piping, etc.--that could be removed was salvaged . . . (Gann 1960:10).

Because of this apparent removal of all items associated with the sawmill, Gann stated that no further archeological investigations were being contemplated.

Husted (1964) discussed test excavations at and near the proposed location of the new visitor's center and associated parking lot. Of the six locations tested (Figure 2.29), two contained archeological remains. The most important of these locations was the remnants of the Ward and Guerrier's Trading Post and a rock-filled firepit that Husted recommended for further archeological investigation. Excavation unit 1 yielded a sample of glass beads and other Euroamerican artifacts, and a series of seven postholes. Excavation unit



Figure 2.24: Prehistoric (or early Historic?) Fire hearth found during land-leveling operations near postulated location of Fort William (from Beaubien 1951c).

2 yielded remnants of a building of undetermined size and orientation (Figure 2.30) and a trash pit at least two feet deep. Several areas of lime mortar were also located in this area, including one area that resembled a foundation (Figure 2.31). A wide variety of artifact materials were recovered here, including various bottles, window glass, seed beads, buttons, ceramics (several patterns), clay pipes, silver, brass, iron (including a projectile point, cans, ox shoe, cut nails), one dollar gold piece (1850 date), firearm pieces, uniform fragments, and various wagon parts.

Excavation unit 3 yielded the remains of a small structure (Figure 2.29) with a lime mortar foundation placed around a series of

postholes. Artifacts found here include various bottles and ceramics, cartridge cases, various wagon parts, ox shoes, horseshoes, nails, screws, cans, leather and bone. Excavation unit 4 yielded one prehistoric firepit, although others were also present on the surface. This firehearth area was later assigned the site number 48GO17 (Table 2.2). Husted recommended further investigations into the prehistoric occupation here, but these have never been conducted. Various Euroamerican artifacts were also recovered including some cartridge cases head-stamped from 1880. Excavation Unit 5 was placed near where old maps suggested a structure might have been placed. The only artifacts collected were those found on the surface.



Figure 2.26: Profile of Old Bedlam north wing trash pit feature, showing series of stratigraphic units containing historic materials (from McNutt 1958).

south end of the Parade Ground. Two other bone and trash concentrations were also found closer to the proposed residence area along the main circulatory road. The proposed construction of the roads, utility lines and residences was not considered to be destructive to any archeological remains, and proceeded as planned.

Falk (1971) investigated an area planned for construction of a drainage ditch and sluice pipe, which covered 3700 feet of drainage right-of-way traversing the northern portion of the fort property (Figure 2.33). Forty-two test units, each twelve feet long and three feet wide, were excavated perpendicular to the main right-of-way and eight

test units, ten feet long and three feet wide, were excavated parallel to the sluice pipe and drain. Approximately 800 historic artifacts were recovered from the various areas, but no structural remains were found. Most artifacts were thought to date after the military occupation of the fort. No further investigations were recommended for five of the test areas. Falk recommended additional work near the "Rustic Hotel" later that summer.

The Rustic Hotel was investigated by the Park Surface in the fall of 1971 (Ehrenhard 1972, 1973a). Archeological investigations were conducted to salvage the remnants of the Rustic Hotel that was destroyed by fire in



Figure 2.27: View looking north in front of Officer's Row, showing location of waterline trench for fire hydrant installation (from Ringenbach 1958a).

the spring of 1890. Excavations recovered a vast amount of archeological material; however it was not possible to discern which artifacts were associated with the original building and which came from civilian occupation of the location following the military period. Based on structural remains found during excavations, Ehrenhard distinguished the kitchen, a cellar, a bedroom and two small areas in front of the hotel (Figure 2.34).

The kitchen appeared to have been heavily salvaged following the fire, with much of the material thrown into the cellar. Most floorboards were removed from the joists and other disturbances were also noted. It was also apparent that the fire that destroyed the building originated in the kitchen. In contrast, the bedroom did not appear to have

been as heavily disturbed after the fire. Construction of the access road to the historic site greatly disturbed the front rooms of the hotel. Ehrenhard faced major interpretive problems because, while the hotel was in existence only for 14 years, recovered artifacts dated from 1840 to 1905 with the area used for a dump long after the hotel burned. As a side note, the investigations here could be considered significant in that this is the only archeological study conducted at Fort Laramie that has ever been published in a professional journal (Ehrenhard 1973a).

In 1973, archeological work continued on the proposed new visitor center reported by Husted (1964). Anderson (1973) reported on test excavations in the proposed entrance roadway to this new visitor center. Indications of surface sites were not found on the

FORT LARAMIE NATIONAL HISTORIC SITE

1958 WATERLINE PROJECT

ROUTE OF WATERLINE

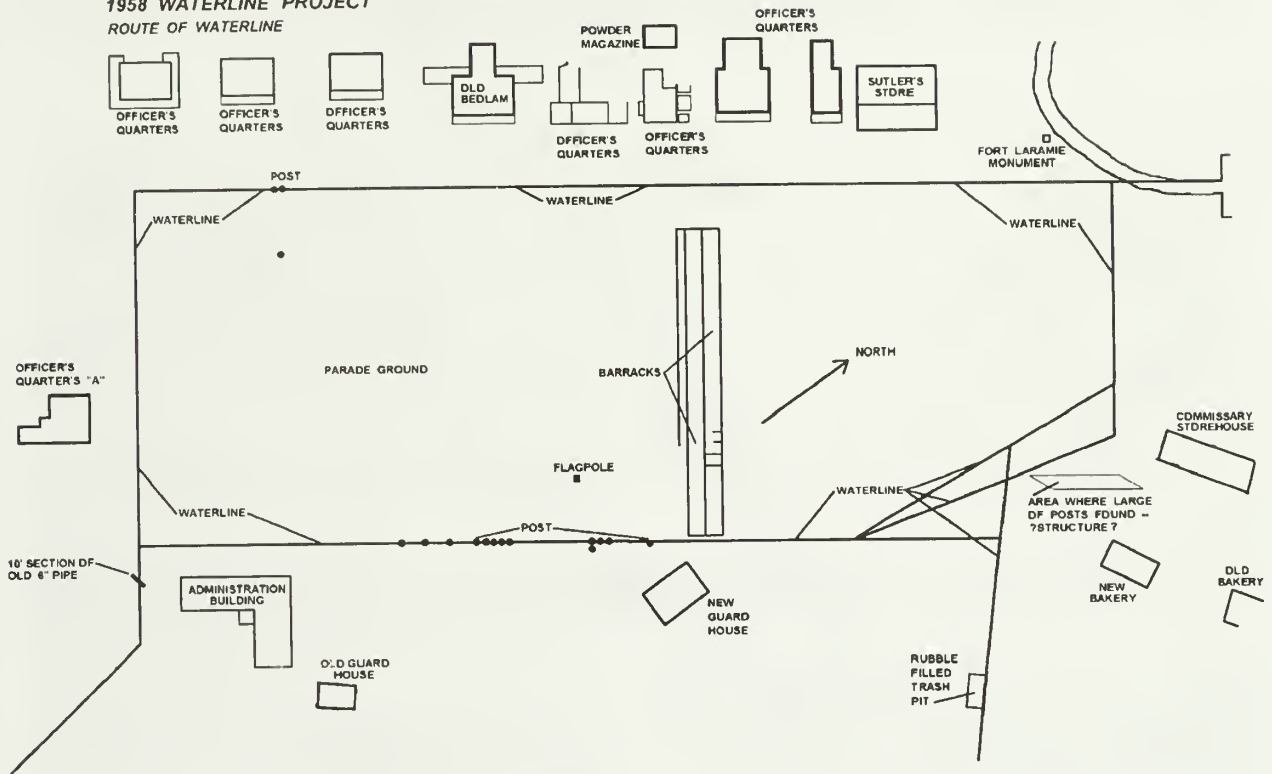


Figure 2.28: Plan view of 1958 waterline trench locations, showing position relative to features found and standing structures (from Ringenbach 1958a).

survey, however previous testing in the area by Husted (1964) and Husted and Moore (1970) produced evidence of historic structures as well as prehistoric occupation. Six test units, three feet square, were placed along the proposed road right-of-way. Four of these are just northeast of where Husted (1964) found several prehistoric firehearths. The other test units were placed 300 feet further east. No cultural materials were recovered from any of the excavation units. Based on the lack of subsurface archeological remains, no further investigations were recommended within the road right-of-way before road construction. However, Anderson (1973) reiterated Husted's (1964) recommendations for the Ward-Guerrier Trading Post before construction of the Visitor's

Center and parking lot.

In the spring of 1984, flooding of the Laramie River caused erosion of 760 meters of the Laramie River bank from the 1866 Guardhouse to below the Civilian Bridge. Before the Park Service riverbank restoration, salvage archeological efforts were conducted (Scott and Conner 1984). These uncovered five features, beginning with a long gravel lens filled with cultural materials that may be the remains of a trash dump behind an enlisted men's barracks in the area. Two of the features uncovered by the flooding were privies, one of which was suspected to be related to a laundress station. The other was related to a drain extending from the General Sink. A fourth feature was the west abutment and associated road ap-

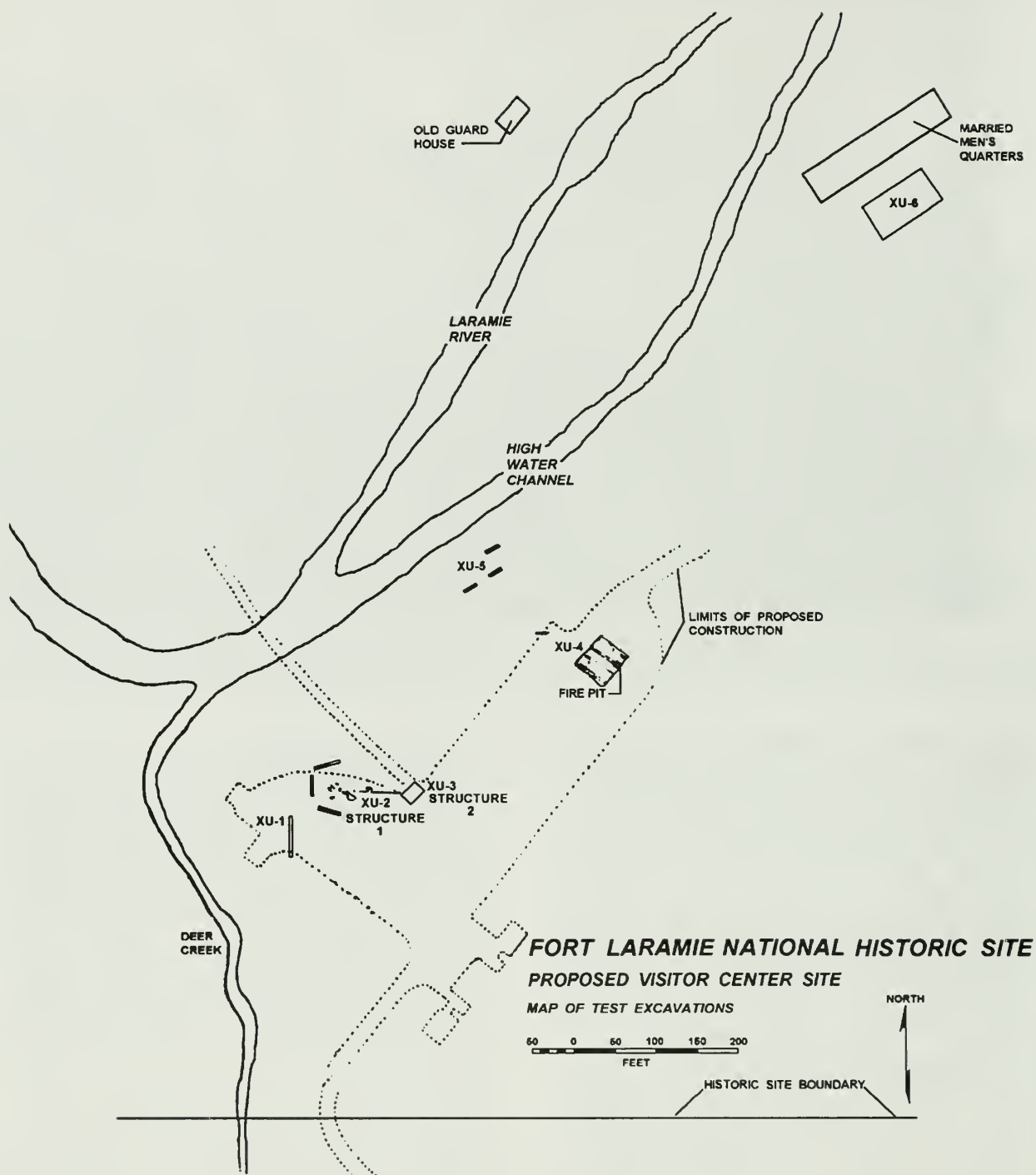


Figure 2.29: Map of proposed Visitor Center Site area, showing locaiton of excavation units relative to other known features (from Husted 1963).

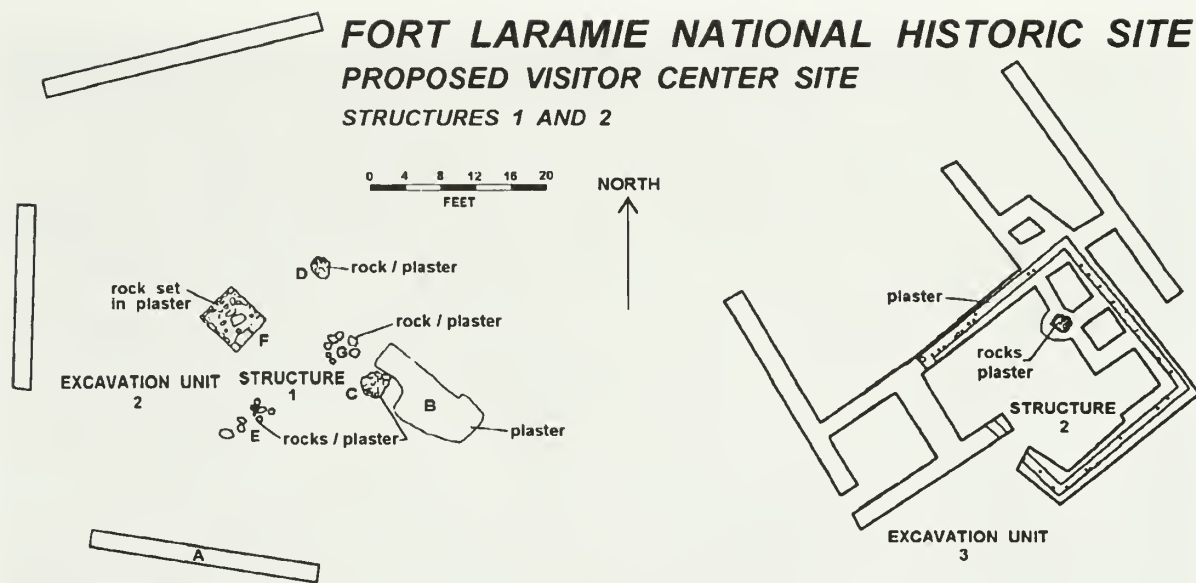


Figure 2.30: Map of Structures 1 and 2, Ward-Guerrier Trading Post, showing excavation units and structural remains uncovered (from Husted 1963).

proach of one of the bridges across the Laramie River. The last feature found was a series of fence posts extending parallel to the river bank. The salvage operations recovered a substantial amount of artifacts detailing much about daily activities at the Fort. All features and materials recovered dated to the military occupation of Fort Laramie.

In the spring of 1985, new underground electrical lines were constructed from the overhead lines behind the Noncommissioned Officer's Quarters to the Sutler's Store and the Commissary Storehouse (Figure 2.35). Two features were discovered during the trenching (Sudderth 1985), including a 10-12 foot long household dump behind the Cavalry Barracks and a disposal area dating from the 1960s east of the Commissary Building. The material recovered from the dump includes bottles from the late 19th and early 20th centuries and bones from cow, pig, chicken and rabbit. Diagnostic embossments on the bottles recovered helped in determining the 1892-1930 date of the dump.

The feature by the Commissary Building consisted of a square frame made from milled boards and wire nails, placed about 1.5 feet below the ground surface. The framed area extended another three feet deeper. Artifacts recovered from this feature were primarily post-World War II in age, including aerosol spray cans and electronic flashbulbs. Isolated artifacts were also found throughout the trench monitoring, including tin cans, ceramics, broken jars and bottles, and spoons.

De Vore (1988) reported on the archeological potential of a modern gravel quarry located in Tract 01-128. The park proposed to eliminate the quarry by both filling and grading it to present a more historic and scenic view. Because of the high degree of disturbance to the area, no cultural resources were identified during the investigation that relate to the Fur Trade and military history period. Clearance was recommended for the project.

The construction of a new drainage

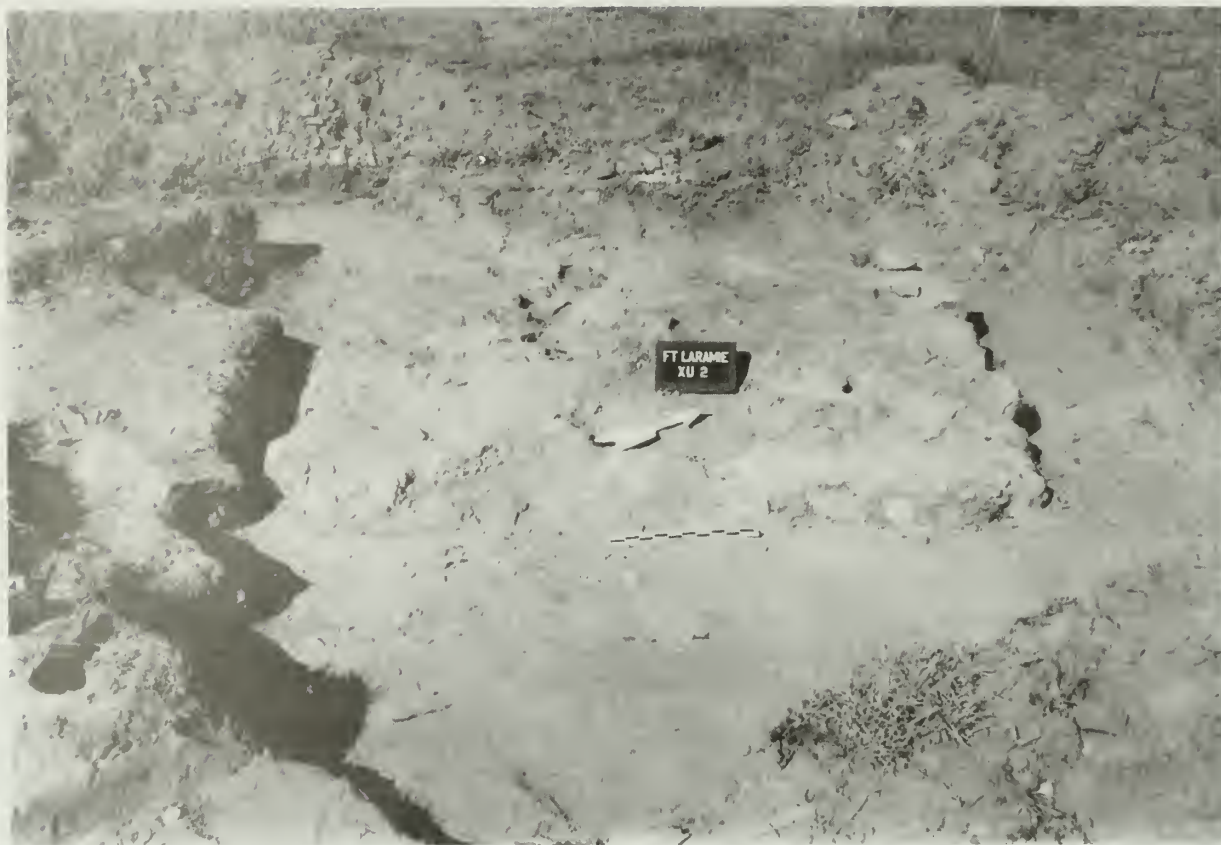


Figure 2.31: Rock foundation plastered with lime mortar found in Structure 1, Ward-Guerrier Trading Post (from Husted 1963).

system at the Burt House required archeological monitoring (Scott 1989). Two drainage trenches and an electrical line trench were excavated during the monitoring efforts (Figure 2.36). Scattered trash and cultural debris were contained in the upper level of the trench fill. Most artifacts recovered appeared to date from around 1875. Several subsurface features were bisected by the trenches, including two trash pits and a midden. The midden and one trash pit date to the military period, and the other trash pit most likely post dates the military occupation. Two posts were recovered in the back of the house, but their function was undetermined. Two sections of the late 1880s era

waterline trench were also recorded in this investigation. Feature 1 and the area of decayed wood were in the region excavated by Beaubien (1953) discussed earlier (Figure 2.18).

Cellar (1976) and Griffin (1976) conducted additional archeological excavation near the Ward-Guerrier Trading Post. Sudderth and Raish (1990) summarized the 1976 excavations at the area to provide a basis for future archeological mitigation of the effects of the construction of the proposed visitor center (Figure 2.37). The primary goal of the excavations was to locate and reexamine the areas excavated by Husted (1964) from which the site datums had been

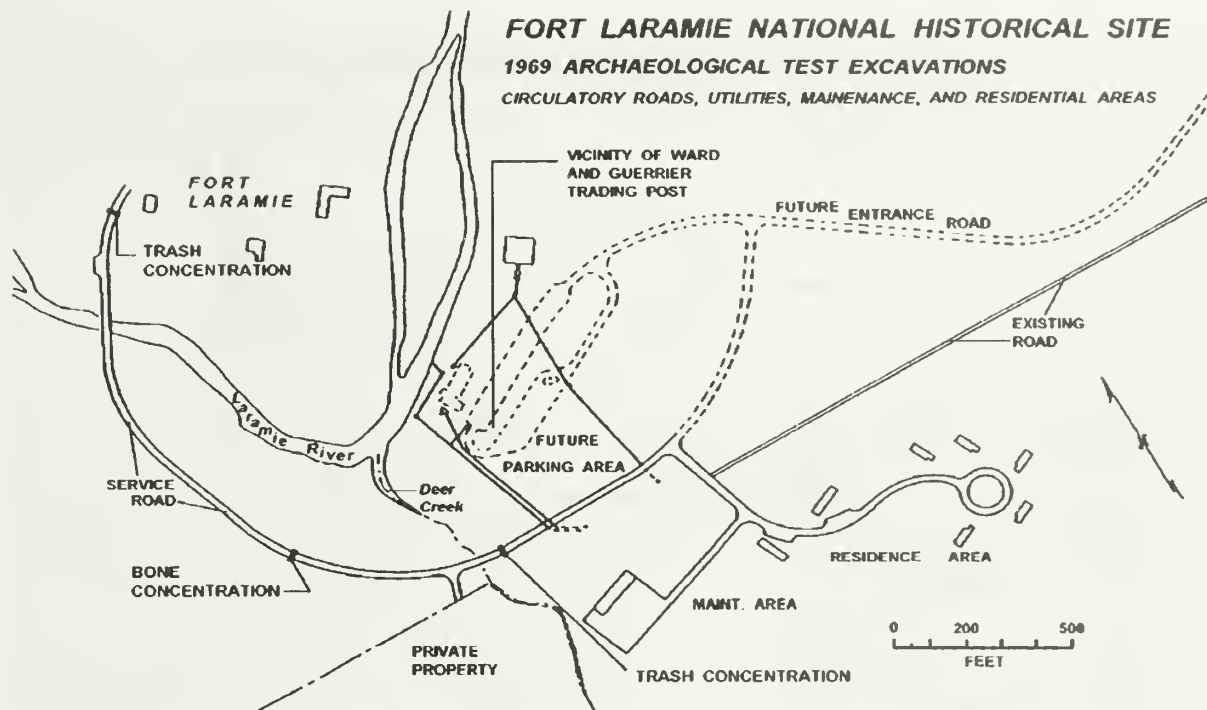


Figure 2.32: Map showing proposed circulatory roads, utility lines, and staff residences relative to historic trash features found (from Husted and Moore 1970).

removed. The presence of several possible structures in the area of the proposed visitor center may represent occupation, but artifactual evidence did not securely identify the site as the Ward and Guerrier Post. It was recommended that two prehistoric hearth features previously found by Husted be excavated before they were destroyed by construction of the visitor center.

Weymouth (1979), in conjunction with the Sudderth and Raish (1990) field investigations in 1976, conducted magnetometer studies across the area Husted (1964) defined as the Ward-Guerrier Trading Post (Figure 2.36). Weymouth identified the trash feature excavated by Husted and a wall and several structures. Because of loss of Husted's datum, these could not be positively correlated to Husted's structures. However, one strong anomaly found by Weymouth (1979) was identified by Sudderth and Raish (1990)

as a blacksmith shop and was probably was the same blacksmith shop identified by Husted (1964). The wall identified by Weymouth was interpreted to be "the north-west side wall of a building some 100 feet long containing an interior structure in the central region of the map, and an out-building to the east containing a smithy" (Weymouth 1979:8).

Cellar (1978) reported on excavation of test trenches near the Cavalry Barracks. These trenches, on the south end of the barracks, attempted to locate a shed that had once been attached to the barracks. While finding one probable corner post, the area had been highly disturbed by post-military construction and no additional evidence was found (Scott et al. 1992:9). Ehrenhard (1973b) described subsurface features under the floor boards of the Day Room and Library in the Cavalry Barracks. Most arti-

FORT LARAMIE NATIONAL HISTORIC SITE **1971 DRAINAGE PIPE PROJECT** **TEST AREA LOCATIONS**

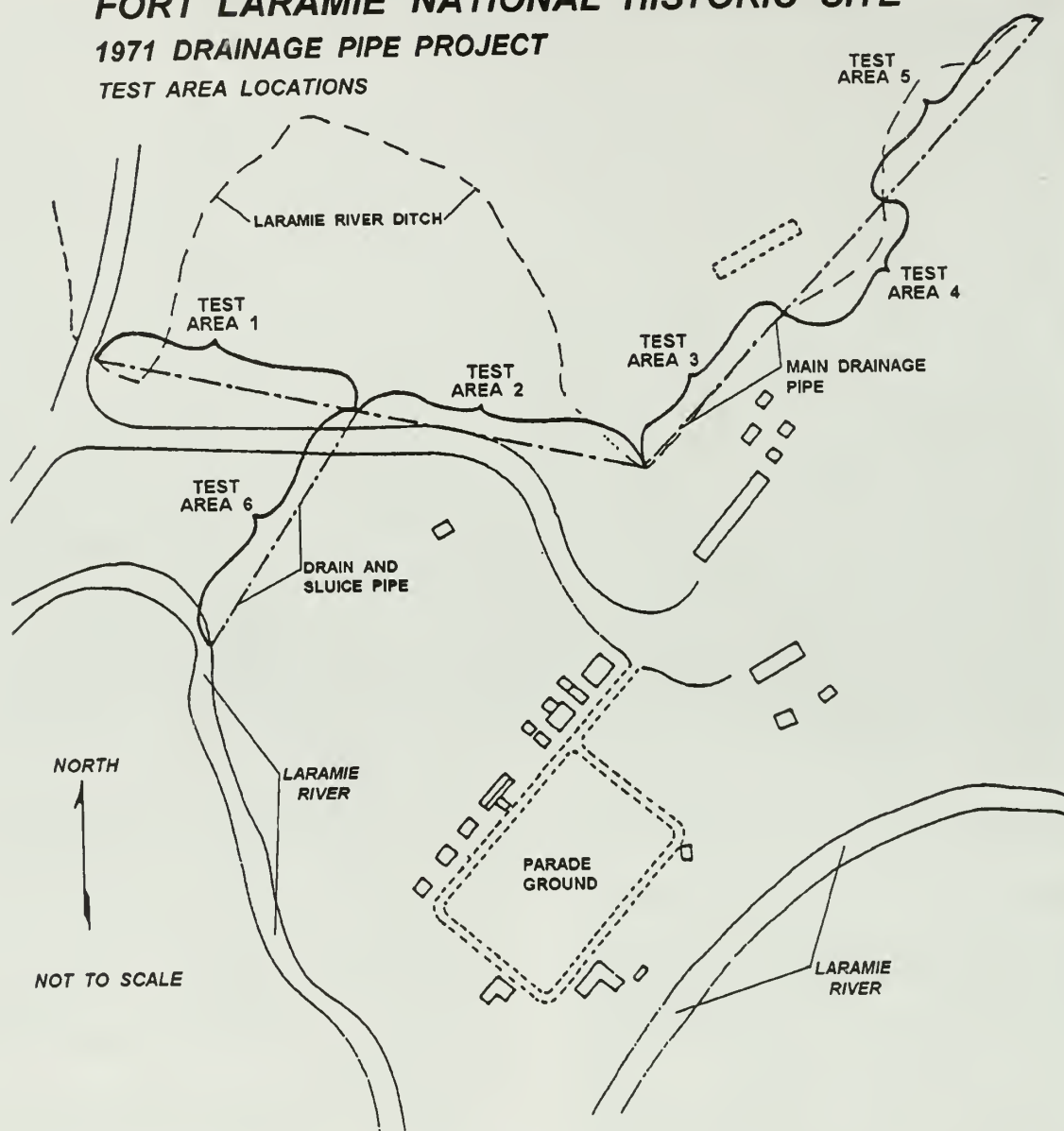


Figure 2.33: Map showing location of various test areas along the drainage pipe project (from Falk 1971).

facts recovered could not be dated to the military occupation. Ehrenhard also attempted to locate latrines behind the barracks. Thirteen small depression and three large depressions were thought to be latrines.

Scott et al. (1992) reviewed archeological studies related to restoration efforts of the

1874 Cavalry Barracks. Archeological mitigation was required in the interior of the building and the area along the west side of the barracks (Figure 2.38). Thirty-six units were excavated, with ten being outside the foundation. More than 5000 artifacts were recovered that reflect the changing uses of the building throughout its history. Three

FORT LARAMIE NATIONAL HISTORIC SITE

RUSTIC HOTEL EXCAVATIONS

HOTEL SUBFLOOR STRUCTURE AND CELLAR FLOOR PLANS

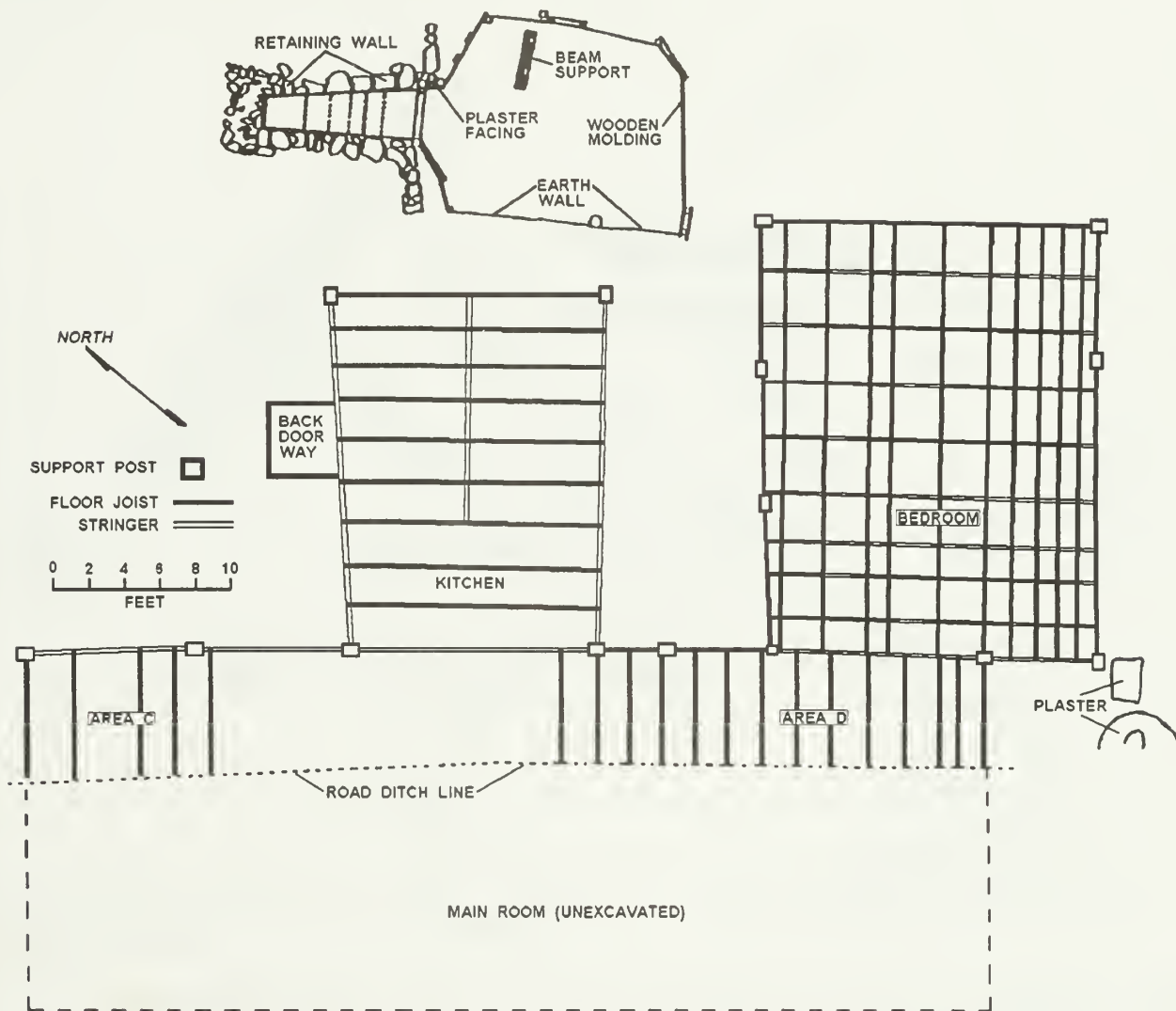


Figure 2.34: Reconstructed floor plan of the Rustic Hotel, based on archeological excavations (from Ehrenhard 1971).

areas of concentrated artifacts were located in the loose dust fill immediately under the floor. These included a group that could be correlated to the 1890-1920 saloon in the barracks, an area correlated with the army saddler's room in the barracks, and a bone pile correlated with the non-commissioned

officer's quarters in the building. Four features that relate to the site's use since the 1860s were found, including the foundations of a structure predating the Cavalry Barracks (Feature 4). Also identified were proposed locations of lime concrete mixing for use in wall construction (Feature 2), a washroom

FORT LARAMIE NATIONAL HISTORIC SITE

1985 UTILITY LINE CONSTRUCTION

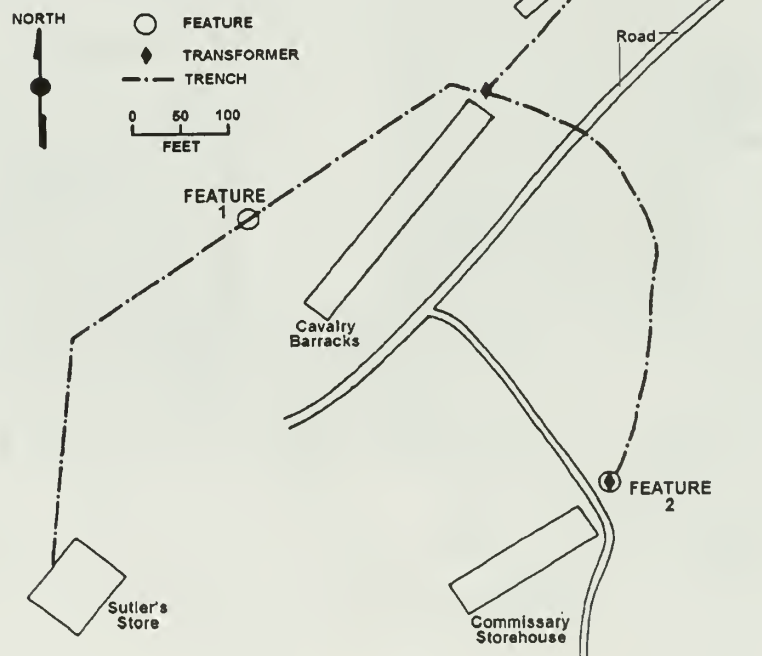


Figure 2.35: Map of new underground power lines, showing route relative to standing structures and located features (from Sudderth 1985).

dry sump area (Feature 1), and a late military or early civilian era trash pit (Feature 3).

De Vore (1990) discussed attempts to locate the defensive trench system around Fort Laramie using ground penetrating radar. While the trench could not be positively located in the area northeast of the Non-commissioned Officers Quarters, the Death

House and two cavalry stables were found. De Vore was able to relocate, using the ground penetrating radar, two of the graves reported by Beaubien (1951) discussed earlier. A linear anomaly on the north side of the hospital building was interpreted to be the defensive trench system in this area of the fort.

FORT LARAMIE NATIONAL HISTORIC SITE

BURT HOUSE MONITOR PROJECT

FEATURE AND TRENCH LOCATIONS

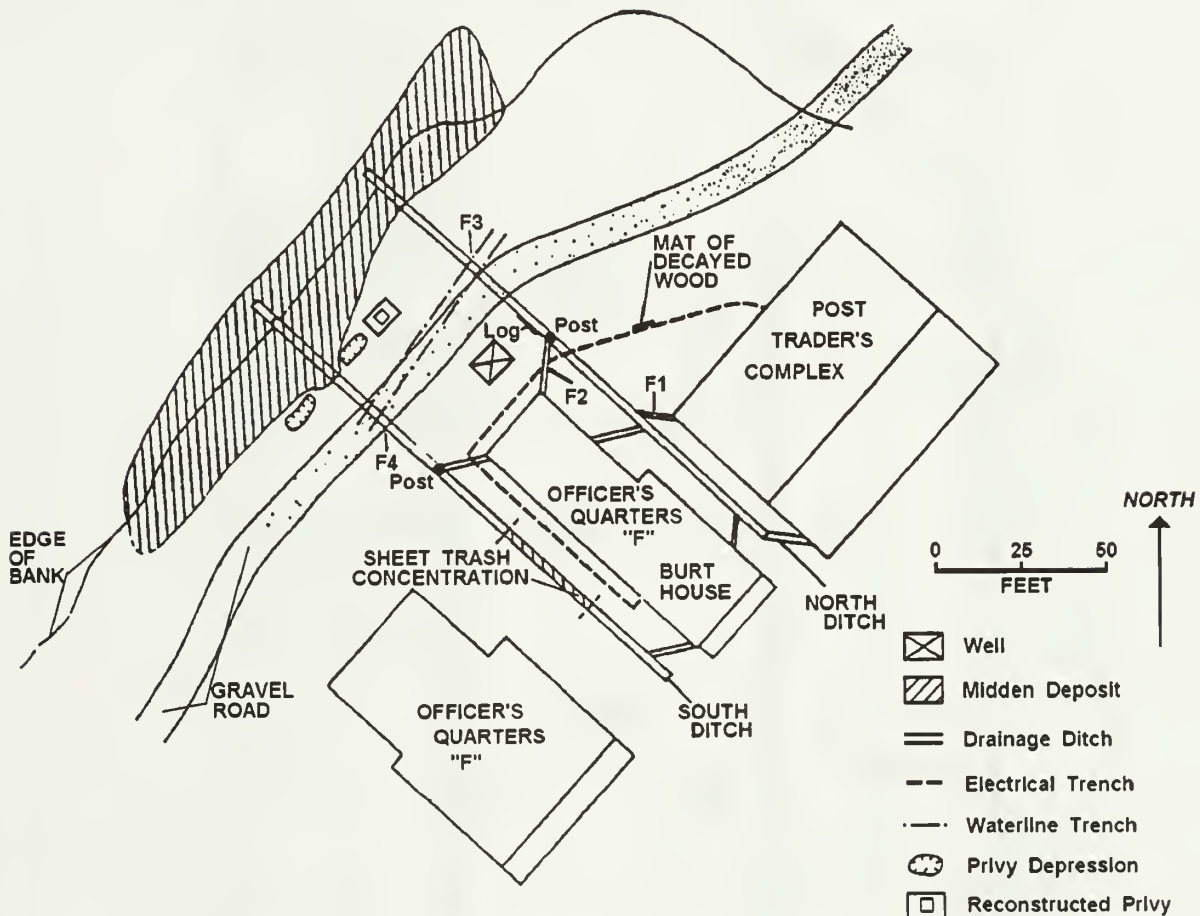


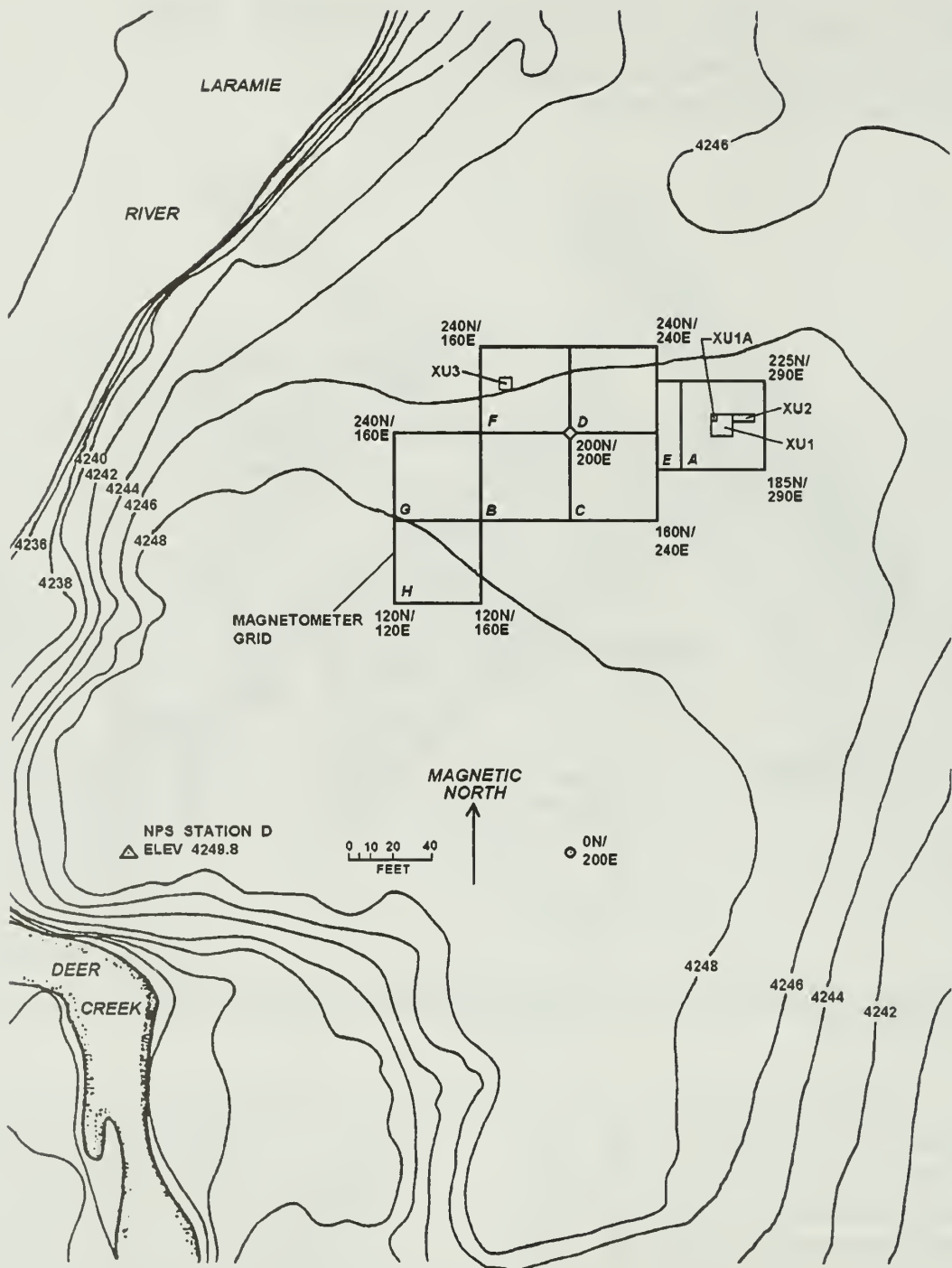
Figure 2.36: Plan of drainage trenches and archeological features recorded at the Burt House (Quarter's "F" (from Scott 1989).

Heimmer et al. (1988) and De Vore (1990) reported on attempts to locate Fort William, the original fur-trading post in the area used between 1834 and 1841, using ground penetrating radar (Figure 2.39).

The profile of Line 2B indicates a disturbed area approximately 150 feet in length . . . The disturbance occurs from a depth of 1.50 to 4.50 feet. The distinct planar echo suggests a buried

surface. A deeper, second disturbance occurs at the eastern end of the disturbed area. It extends from a depth of 6.00 to 9.00 feet. The radar echo is represented by a series of arcs which are interpreted as a wall trench or foundation. The interpretations of the profiles suggest the location of Fort William (De Vore 1990:31).

De Vore recommended additional remote



FORT LARAMIE NATIONAL HISTORIC SITE
WARD AND GUERRIER TRADING POST
 MAP OF 1976 TEST EXCAVATIONS AND MAGNETIC SURVEY

Figure 2.37: Map of 1976 excavation areas and magnetometer survey grid at postulated Ward-Guerrier Trading Post location (from Sudderth and Raish 1990).

FORT LARAMIE NATIONAL HISTORIC SITE
CAVALRY BARRACKS EXCAVATION PROJECT
FLOOR PLAN, EXCAVATION UNITS AND FEATURES

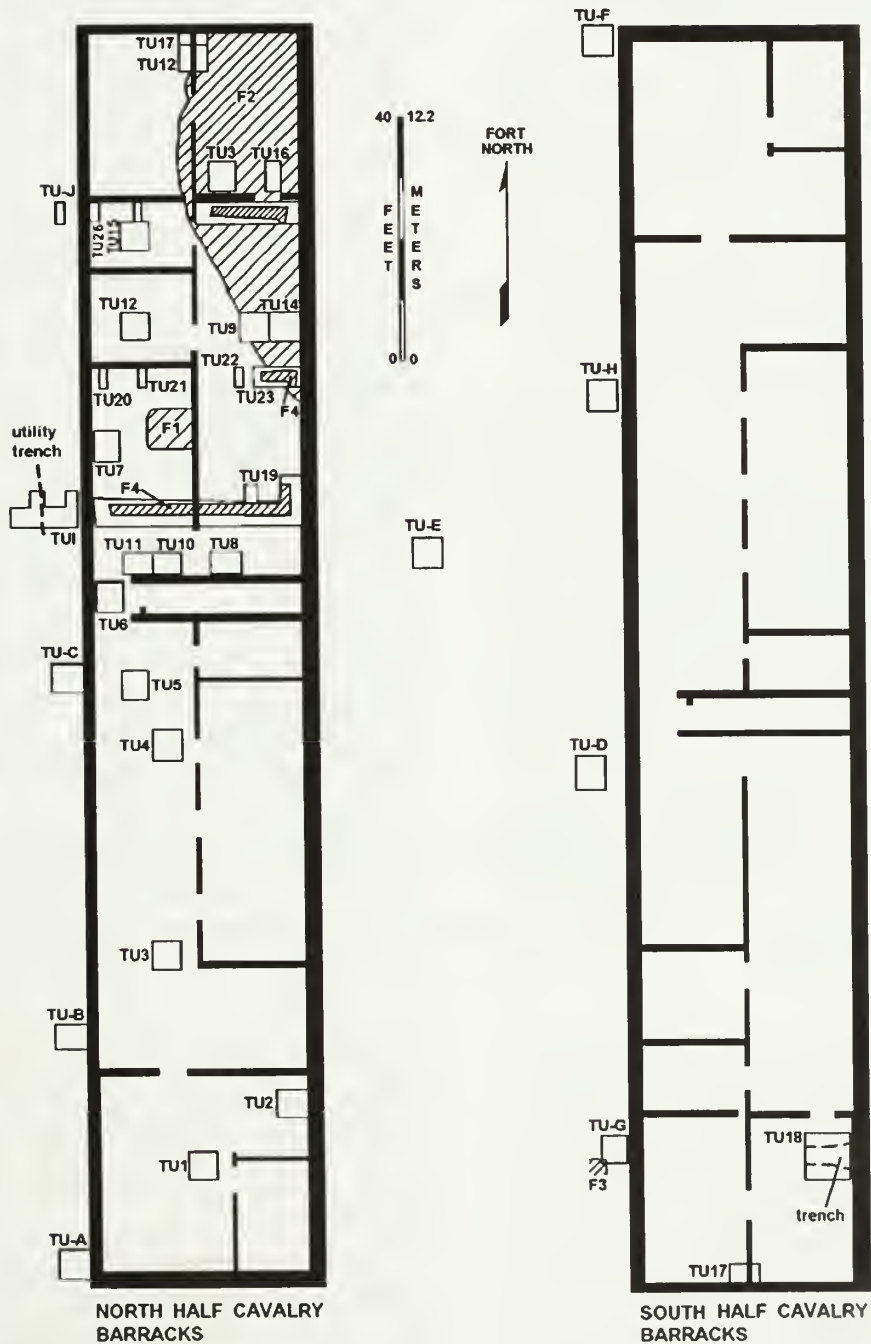


Figure 2.38: Plan view of 1985 archeological excavations at the 1874 Cavalry Barracks, showing location of test units and located features (from Scott et al. 1992).

**FORT LARAMIE NATIONAL
HISTORIC SITE**
**FORT WILLIAM GROUND
PENETRATING RADAR PROJECT**
SECTION 22, T26N, R64W, GOSHEN CO.

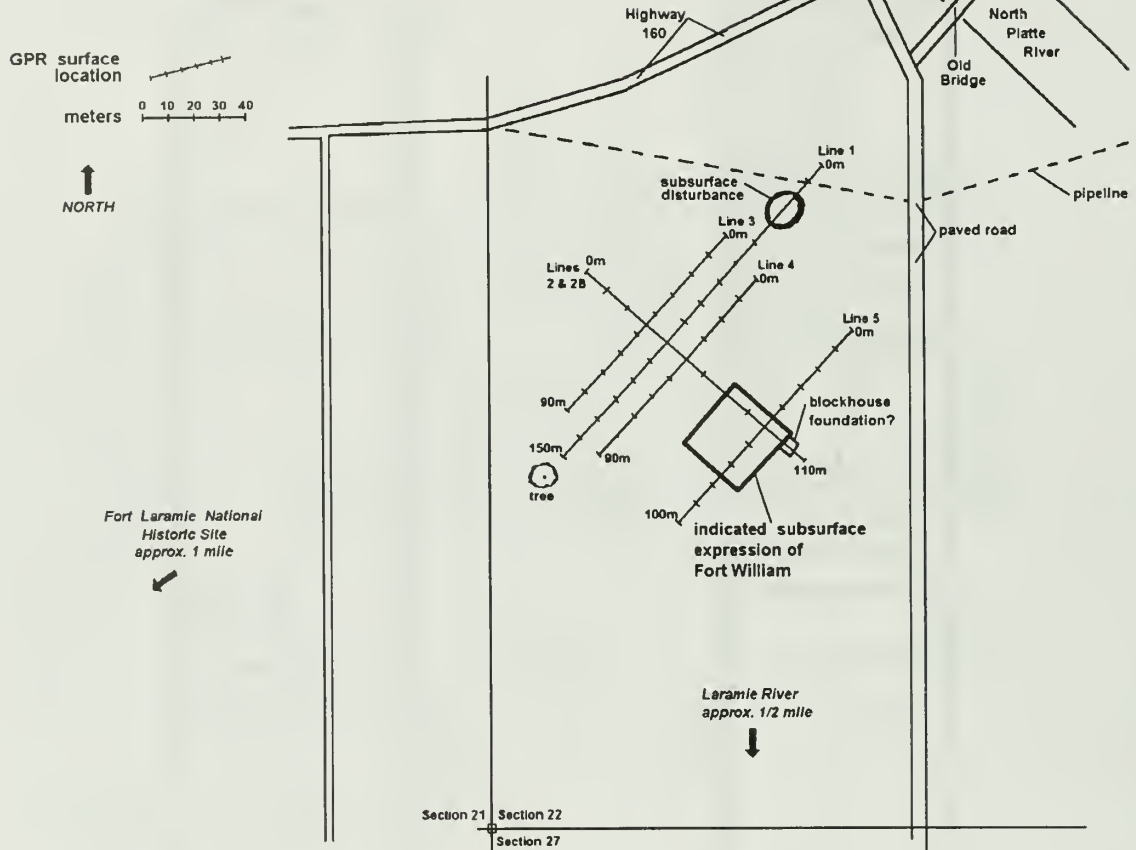


Figure 2.39: Plan view of ground penetrating radar grid over postulated site of Fort William (from De Vore 1990).

sensing work on the area, as well as excavations to provide ground truthing of the anomalies located by the ground penetrating radar. This work was conducted in 1992 (De Vore 1992). The magnetometer and conductivity data recovered in 1992, along with several shovel tests, did not verify evidence for the presence of Fort William, but it did show that cultural anomalies were still to be found in the area. No explanation was given for the large anomalies found in 1988, other than

probably being cultural in origin. Recommendations for future work to locate Fort William included further geophysical survey along with continued research of archival literature.

While Ehrenhard (1973a) remains the only published discussion of Fort Laramie archeology, at least three other publications use Fort Laramie archeological data. Wilson (1961, 1971) described a typological survey of clay pipes recovered from the fort area over a two

decade period. The reports only discuss pipes and fragments that are distinctive and could be diagnostic of time period, manufacturer, or place of origin. Wilson provided information on manufacturing techniques, types and styles from the time period, and manufacturers. Pipes from other Northern Plains military sites and trading posts were also described and photographed by Wilson (1971). This serves as a valuable reference source for study of this type of artifact.

Wilson (1981) published a similar report on the extensive collection of bottles from Fort Laramie and Fort Union, New Mexico. Like the clay pipe publication, this is the major reference for bottles on the western frontier, especially for sites dated from or associated with military occupations. Bases, makers' marks, finishes, embossing, and other characteristics of these bottles are described and illustrated.

Additional archeological investigations were conducted at other locations. However, these reports are not on file at either the Wyoming SHPO Cultural Records Office or Fort Laramie National Historic Site. These unavailable reports include Cellar (1976, 1978) and Ehrenhard (1973b). Because of their unavailability, summaries of their contents and findings cannot be independently prepared. Samson (1986) examined backhoe trenches related to a new sewer and leach line project near the Cavalry Barracks. Scattered artifacts were found, but no intact features (L. Samson, personal communication, 1994). Scott (1987) reported on a survey of the new parking lot located north of the Sutler's Store before leveling and paving. No cultural resources were found (Scott et al. 1992:8). Scott (1990) also monitored new water line trenches between the Cavalry Barracks, the Commissary, and the riverbank. Post-military features were

found along the water lines. At the riverbank, the trench intersected a late military period trash dump (Scott et al. 1992:8).

SUMMARY

Since Fort Laramie National Historic Site returned to public property in 1937, many archeological studies have been conducted. These have primarily been related to specific project needs, usually building stabilization. However, if one were to map the distribution of these various projects around the fort area, one would find them to have been scattered and fairly haphazard in distribution.

There has been no comprehensive archeological survey/study of Fort Laramie National Historic Site. The archeological research potential of the site remains untapped. Each future restoration or construction project will continue this haphazard additions to the data base. A Cultural Resource Management Plan (CRMP) with a comprehensive pedestrian survey of the entire park property should be developed soon, before additional construction needs occur. If we don't know where the archeological resources occur within the boundaries of a National Historic Site, these resources that define the site cannot be properly managed.

CHAPTER 3

FIELD AND LABORATORY METHODOLOGY

by

Danny N. Walker, Anne K. Armstrong and Laura Niven

The field methodology discussed below for the Fort Laramie Quartermaster Dump Project was designed before initiating the project (see Walker 1994). However, field realities often require changes in specific portions of predesigned methodologies. This may include deleting certain aspects of the predesigned model, or adding areas to the model that become necessary as the field work or laboratory analysis progresses. The following description of the methodologies used reflect those changes.

GENERAL EXCAVATION PROCEDURES

Archeological investigations at the Fort Laramie Quartermaster Dump began with establishment of a series of 20 m blocks in a grid across the impacted area (see Figure 1.2). This placement was based on the probable area of impact during stream bank stabilization. This 80 x 280 m grid encompassed the entire area of the river bank that needed stabilization and most of the area that was investigated during the present project. Based on surface artifact distributions, some dump area extended north and east of the grid.

This basic grid was, and will be, the recording basis for all future archeological investigations and subsequent monitoring at the dump area. It was tied into known bench

marks at the fort, and extant building corners. This also provided a permanent reference for future work in the area, including projects not associated with the present project. It also will provide a reference base for monitoring future erosion of the river bank. Two permanent concrete data were placed away from the river bank, but within the grid system, for erosion monitoring and reference. These data were placed at N1000/E1000, with an arbitrary elevation of 100 m, and at N996.5/E820.12, with an elevation of 99.86 m, relative to N1000/E1000.

Before actual archeological excavations began, the grid was used to conduct a series of remote sensing activities across the impact area (see Somers, this volume). These included soil resistivity (Clark 1990), and fluxgate magnetometer (Clark 1990; Breiner 1973). The two remote sensing methods served as a check on each other and were followed by ground truthing (i.e., excavation). A major aspect of conducting any archeological excavations such as these is to provide direction for future management of the site. While the main purpose of the present project was to investigate the area of a dump that is actively eroding into the river before stream bank stabilization, we also must look at areas away from the dump to interpret properly and understand what is

eroding away. The use of remote sensing techniques greatly speeded the investigations away from the river without taking time away from the main work along the river bank. Under the limited period available for completion of the archeological field work, the ability to use remote sensing techniques to examine the area away from the bank was highly cost effective. Even when time and money are not constraints, remote sensing of archeological sites before excavations has been shown to vastly aid in the excavations (Clark 1990).

Systematic backhoe trenching was conducted over the project area (see McFaul et al., this volume). These systematically placed trenches were dug to confirm results of the remote sensing (e.g., any anomalies along this portion of the project area) and to expand our view of the site beyond that available from the proposed hand excavations. Photographs were taken of all backhoe trenches and select profiles of the geological and cultural strata present of some trenches were drawn as part of the recording process.

Besides the backhoe investigations discussed above, we proposed a minimum of forty (40) hand excavation units to be placed across the site area. By the end of the 1994 field season, 136 units had been excavated, of which 47 were only partial units because of their proximity to the river bank (Figure 3.1). These hand excavated units were primarily concentrated in four block areas along the river bank, exposing the stratigraphy and collecting various artifacts already eroded from the bank. Thirty full units were placed away from the bank, in three block areas, expanding on features found in the backhoe excavations or to ground truth features noted during the remote sensing operations.

Based on the results of the remote sensing (see Somers, this volume) and river bank cleanup (see LaBelle this volume), it became apparent that artifacts were concentrated in specific areas along the river bank and not spread along its entire length through the dump area. Therefore, to test whether some areas of the river bank did not contain artifacts, a secondary two m by two m grid was established (using the main site grid coordinates) over the areas between the block excavations (Figure 3.1). An eight inch power auger was used to drill a series of auger probes across this grid. Specific methodologies and results of this auger testing can be found in LaBelle (1994; this volume).

The following procedures were employed during the hand testing phase of the investigations. Excavation units were oriented to magnetic north (as was the entire grid system) and tied into the principal mapping datum of N1000/E1000 m for Fort Laramie National Historic Site. All elevations were measured relative to this principal mapping datum of the site, with an arbitrarily established elevation of 100.00 m. Both shovel shaving and trowels were used as appropriate. Excavations ceased when culturally sterile deposits were reached between ten and 40 cm below ground surface.

The southwest corner of each unit was used as the mapping reference point for the individual units. Elevational control was maintained through either a builder's level or transit. All fill (sediment) was dry screened through 1/4" mesh hardware cloth, with selected units screened through 1/8" mesh hardware cloth. Features were recorded and otherwise described according to standard archeological procedures used by the Wyoming State Archaeologist's Office for such analyses. All artifacts, except select founda-

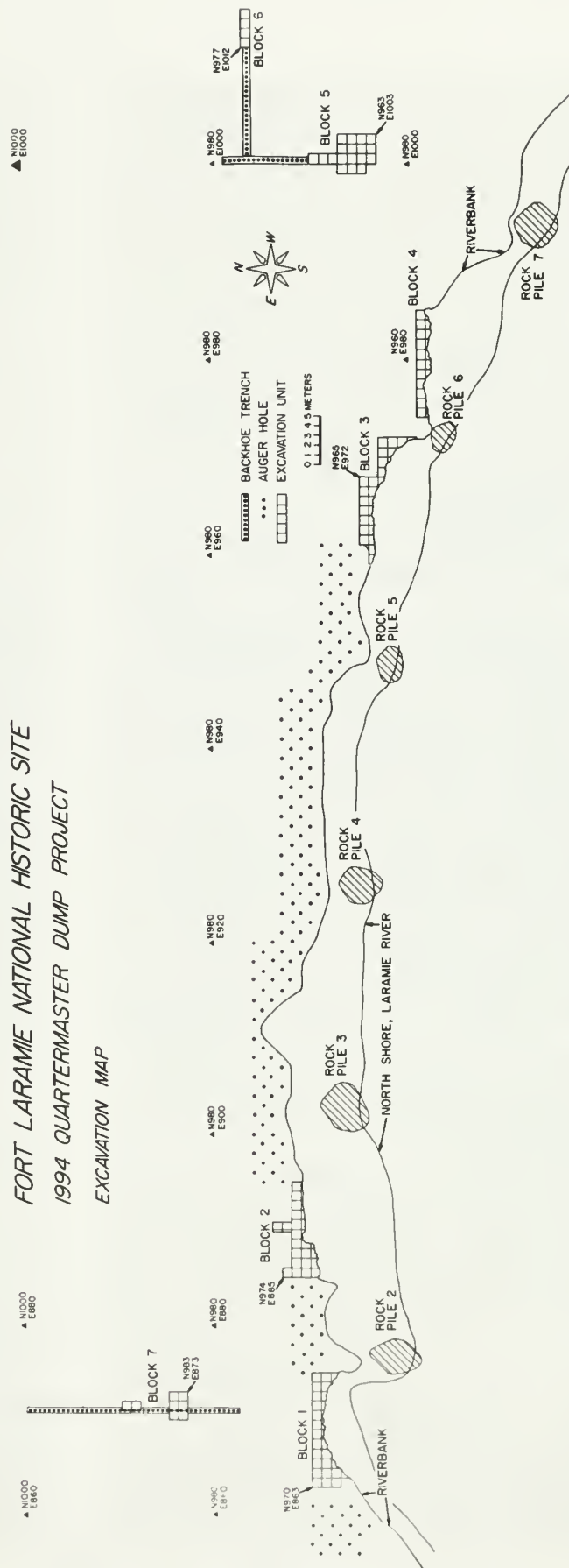
tion materials, bricks, wood fragments, and other large pieces of structural remains, were collected for laboratory analysis. Any uncollected artifacts were counted and described (including noting brick makers' marks) in the field. Notes were taken for each level excavated, describing both cultural and natural materials located, sediments, or other noteworthy observations. At least one wall was profiled in each test unit when distinctive stratigraphy was present. Both black and white photographs and color slides were taken as appropriate. Following completion of excavations and investigations, all units and backhoe trenches were backfilled.

LEVELS

Excavations were conducted within natural stratigraphic levels, using arbitrary ten or five cm levels within the natural stratigraphic levels. That is, if a natural level was reached before the end of an arbitrary level, a new level was established at the top of the new natural level. Generally, ten cm arbitrary levels were used, unless the quantity of artifacts within the test unit was so great that a five cm level provided greater control.

Natural levels

Natural levels were defined as usually more or less homogenous layers, with differential proportions of sand, loam, clay, pebbles, etc., that varied from layer to layer. Each natural level was described by its color (although there were exceptions), texture and structure. The texture depended on the proportional



representation of each constituent (sand, gravel, clay, etc.). A level might be described as composed of sand enclosing many quartz gravels. The structure of the sediment is described as the way the constituents of the layer were organized. For example, a layer may be formed of sand cemented by carbonates. A natural level is rarely horizontal and varies in thickness. It is for this reason that excavators continually checked the stratigraphy and noted any variation in structure, texture, and color on their form.

Archeological levels

These levels are what remains of each human occupation of the site. A single natural level may contain one or more archeological levels. Occupation floors consist of the remains of an occupation that have not been subsequently disturbed. A true occupation floor is in the same state as when it was abandoned by the site occupants. This is a rare state of affairs, as multiple disturbances have usually deformed the original floors. Diffuse archeological levels are more common. These mark an occupation surface that has been slightly disturbed by slight solifluction or other disturbance. They appear as a greater density of objects at a particular level. It is most important to try to maintain separation of different archeological levels during excavation and in the laboratory.

Arbitrary levels

Arbitrary levels varied between five and ten cm deep, with some other depths as well, within a natural or archeological level that provide for greater excavation control, primarily in the recovery of the screening materials. If a new natural level was encountered before completion of an arbitrary level, then excavations stopped in that arbitrary level. If the natural level sloped, continued excavation required partial units of additional arbitrary levels before completion of the first

natural level and initiation of the second natural level. That arbitrary level, in turn, will begin with a partial unit to a depth of the first arbitrary level, to "level off" the excavation floor.

HORIZONTAL DATA CONTROL

Horizontal measurements were taken from the southwest corner of the unit, that is, all measurements were to the north and to the east. For most artifacts, measurements to the nearest centimeter were sufficient. However, if *in situ* diagnostic artifacts smaller than one cm were recovered, horizontal control was to the nearest mm. All excavations were by 1 x 1 m units, however, some units were excavated in 50 x 50 cm quads, depending on the situation. In these cases, artifacts were still mapped horizontally from the southwest corner of the 1 x 1 m test unit.

VERTICAL DATA CONTROL

For most units in the main part of the dump, vertical control was taken by using a transit or builder's level. Vertical depth was recorded as above or below site datum, not ground surface. Each day, in the morning and at noon, the builder's levels were recalibrated back to the main site datum, set arbitrarily at 100 m above datum. For the most part, vertical control was taken on the bottom of the mapped artifact. If artifacts were "taller" than ten cm, then both top and bottom depths were taken and recorded.

DEPTH CONTROL

Surface elevations (relative to the site datum) were taken at the beginning of each test unit on the ground surface, at 50 cm intervals, producing nine measurements per unit. A separate surface map was prepared for these data. Depth measurements were then recorded at the bottom of each level after that. Separate maps were prepared for each level. The final map for the test unit showed the final depth measurements for the

unit.

MAPPING FORMS

Mapping was done as accurately and clearly as possible. The grid on the mapping form used represented one square meter, with smaller squares on the form representing five cm. North was always to the top of the map. Each item recorded on the back of the mapping form as a point plotted item also appeared on the front of the form on the map. All items were drawn accurately in position, using the measured coordinates. If possible, object numbers were written inside the outline, otherwise beside it so it is clear to which object it belongs. If the item was larger than ten cm in maximum dimension, a provenience point was marked on the item with a marker. This was the point measured to and recorded on the mapping form. Rocks or other materials that were not collected were drawn as accurately as possible and not just sketched. Also, both top and bottom vertical measurements were taken on such items.

Maps and screen bags were changed every time a new natural or arbitrary level was started. All artifact bags, point-plotted or screening, were placed in a "UNIT BAG," with the outside of that unit bag marked with the same information described below for the individual artifact bags.

The back of the mapping form contained the main recording information for the level. Specific comments about the level were recorded by the excavator, including features, associations, soil types, rodent disturbance, etc. Each object recovered from a unit was assigned an Object Number, starting with "1" for the unit and continuing consecutively for the remainder of the unit. Each mapped artifact received a separate object number. This included all level screening bags. If more than one screening bag was

filled from a level, a separate object number was assigned to each level bag. Artifacts smaller than five cm in maximum dimensions were not mapped. Identifiable artifacts smaller than this mapping cutoff were recovered in the dry screen. Depth above or below datum was recorded for each object as the vertical control of each artifact as described above. Horizontal control of each artifact was recorded as cm N and cm E. Strike and Dip were taken on artifacts greater than ten cm, unless metallic, then strike could not be taken, as a compass was used for this measurement. Object description was recorded as the artifact name, screen bag, etc.

At the end of each excavation day, or upon completion of a level or test unit, all artifacts and information on the bags were checked against the information on the mapping form, to eliminate possible mistakes and correct them before the artifacts were stored. All completed maps, notes, forms, records and associated artifacts were given to the crew chief upon completion of a test unit. Each individual excavator was responsible for the accurate recording of data, and the location and collection of the artifacts within their respective units.

Each mapped item was placed in its own individual bag, which was labeled with the following information site name: site number; unit designation; object number; level number; level below datum; object name; excavator's name (not initials); and collection date. This information was written on each field bag in either ball-point pen or "sharpie."

UNIT RECORD FORM

Unit Record Forms were filled out for each excavation unit. This form was used to track the completion of all data recording for the unit and was the first form started for

each unit. The following information was recorded on this form. "Completed" was noted as "yes" or "no" depending on whether the arbitrary or natural level was completed or whether the bottom of the unit was below the known cultural levels upon ending work in the unit. "Forms Completed," again "yes" or "no," meant that all forms had been completely filled out for the unit. "No. Bags" was a count of the total number of bags with artifacts for that particular level. "Photo Nos." was filled in if something from that particular level had been photographed. Negative numbers were provided from the photo log at the time of photographing. If no photographs were taken, these columns remained empty.

WALL PROFILE FORM

As is normal in most archeological excavations, most unit walls were profiled. The main introductory heading information on this form was the same as that for the mapping form. One cm on the profile form equaled ten cm of the wall profile. At least one profile was completed for each unit and often a second one at 90 degrees was completed. This form was also used for feature profiles.

PHOTOGRAPHIC LOG FORM

The Photographic Log form was used to keep track of all photographs taken with the official site camera(s). All photographs were taken with a scale included in the frame of view. Each roll was numbered consecutively throughout the field season, by color.

DAILY JOURNALS

Each crew member kept a daily journal in bound notebooks provided for that purpose. At the end of the fourth work period, these were turned over to the project supervisor for archiving with the project files. Those journals were a daily diary of everything done on the various excavation units. This

was different from the specific notes on the excavation level that was taken on the Mapping Form and Record Continuation Form. This was a record of what the excavators observed about the unit as a whole, any mistakes made, or problems encountered. This record served as a cross-check and summary set of notes, but was also used during preparation of the project report when the individual crew members were no longer present to be asked about a given excavation unit.

LABORATORY METHODS

All collected artifacts, field notes, maps, profiles, photographs, and other records were transported to the Wyoming State Archaeologist's Office and the Department of Anthropology, University of Wyoming, in Laramie, for cataloging, analysis, and report preparation. Prehistoric artifact analyses were consistent with other investigations prepared by the Wyoming State Archaeologist's Office (see Walker 1990). All artifact material collected from the dump area was identified and analyzed as to type, function, or usage. Descriptions were made of excavation results from each hand test unit. These detailed all cultural materials and features found in those specific units, and any other noteworthy observations.

Historic artifact analyses were consistent with previous archeological investigations at Wyoming state parks, specifically recent studies at South Pass City State Historic Site (Walker 1990; Walker and Hauff 1994). These have employed an artifact classification system similar to that used by South (1977). South (1977) was among the first to use a standardized classification system to simplify the comparison of artifactual assemblages among different structures and occupations. This system is a functional classifi-

cation system and consists of several artifact types organized into eight artifact groups. These groups include kitchen, architecture, furniture, arms, clothing, personal, tobacco pipes, and activities. South (1977) designed this system to understand and describe eighteenth and nineteenth century agricultural and urban occupations in the southeastern United States. In its original format, it is not completely applicable to nineteenth century western military forts. It has been adapted and used at military sites (Fawcett 1981; Marcel Kornfeld, personal communication, 1994). Several categories are useful and others can be adapted as the analysis proceeds.

Cataloging and preparation for artifact storage was completed as detailed by Jessup (1992), using the Automated National Catalog System (ANCS) computer program designed for National Park Service museums. This work was done under the direct supervision of the Fort Laramie National Historic Site Curator. After cataloging and analyses were completed and report(s) submitted, all collected and curated artifacts were transferred to Fort Laramie National Historic Site for permanent storage using storage procedures outlined by the National Park Service (1984, 1990) (Table 3.1). These materials are thus be made available for interpretive and educational purposes. Most other archeological collections from Fort Laramie National Historic Site are already curated and housed on-site.

Table 3.1: ANCS accession numbers with corresponding block excavation areas, Fort Laramie National Historic Site Quartermaster Dump Project.

| ACCESSION NUMBER | BLOCK EXCAVATION AREA |
|---------------------|-----------------------------|
| FOLA 851 | Block One |
| FOLA 852 | Block Two |
| FOLA 853 | Block Three |
| FOLA 854 | Block Four |
| FOLA 855 | Block Five |
| FOLA 856 | Block Six |
| FOLA 857 | Block Seven |
| FOLA 858 | Riverbank and Auger Probe |

CHAPTER 4

GEOPHYSICAL REMOTE SENSING SURVEY OF THE QUARTERMASTER DEPOT DUMP AT FORT LARAMIE NATIONAL HISTORIC SITE

by
Lewis E. Somers

INTRODUCTION

Geoscan Research (USA) conducted a series of shallow geophysical surveys at the Quartermaster Depot Dump, Fort Laramie National Historic Site. The broad purpose was to discover and map areas of high and low archeological potential. A high sample density magnetic field-gradient survey was first conducted over the project area. This survey maps subsurface magnetic anomalies associated with previous land use. At the Quartermaster Depot Dump these anomalies are primarily associated with iron objects, pits, fire pits and hearths (prehistoric and contact) and historic architectural elements. A high sample density soil resistance survey was also conducted. This survey maps subsurface resistance anomalies associated with previous land use. At the Quartermaster Depot Dump these anomalies are primarily associated with pits (historic and prehistoric) and historic architectural elements.

In the following, the specific goals of interest and a description of survey design, survey methods and results for the remote sensing are presented. The principal data presentation format is a series of black-white halftone maps. These maps are similar in appearance to aerial images. The magnetic field-gradient and soil resistance data are

represented by degree of gray level.

SURVEY PURPOSE AND GOALS

The specific goals and purpose of these surveys can be summarized as follows:

1. To identify the spatial extent and location of artifact materials along the river bank that may be in danger of eroding into the river.
2. To locate and map subsurface architectural features that may be in danger of eroding into the river.
3. To identify areas along the riverbank that have a high (low) probability of containing significant archeological materials.
4. To identify concentrations of artifact material that may or may not represent individual dumping episodes.
5. To identify fired areas that may represent dump firings, burned structures or Native American campsites.

SURVEY METHODS

Three geophysical remote sensing methods have potential at the Quartermaster Depot Dump. These are ground penetrating radar (GPR), magnetic methods and soil

resistance methods (Clark 1990). GPR was not considered feasible because greater area coverage was available from the resistance and magnetic methods at the same cost and no loss in subsurface feature detection probability. The other methods are simply more cost-effective in this specific situation.

Magnetic methods respond to subsurface cultural features that alter the earth's magnetic field. These include stone architectural features, fired soils, iron objects and implements (including totally rusted objects) and (in iron rich soils) compaction (floors, paths, etc.). Resistance methods respond to subsurface cultural features that alter the physical soils per se (type, density, composition), the soil moisture content and the soil salinity. Agriculture, pits, floors, hearths, fire pits, and architecture (including paths and roads) are representative cultural features.

MAGNETIC FIELD GRADIENT SURVEYS

Magnetic field gradient surveys measure the distortion of the earth's magnetic field caused by the subsurface archeology. The archeology has two basic properties or mechanisms by which it distorts the earth's magnetic field (Breiner 1973; Clark 1990). These are called the *remnant magnetization* (a permanent magnetic field) and the *magnetic susceptibility* (a bulk magnetic property similar to pH). Both mechanisms alter the local magnetic field and thus are mapped as distortions of the earth's field. This field changes continuously with time and this change must be removed from the survey data to reveal the archeological components. Thus, surveys are performed with two magnetic sensors and the data from one (a reference sensor) are subtracted from the other to remove the time dependent changes.

The remnant magnetization is the familiar "permanent magnet" effect associated with

iron and steel objects. It is also associated with ceramics, hearths, fire pits and fire altered soils. Remnant magnetization in soils originates from heating the iron oxides (found in most soils) above a critical temperature (about 400° C). When the soil cools, the temperature induced changes in the iron oxide crystals are "frozen" and are thus available for survey.

There are two states in which these crystals can be frozen. The first (aligned state) is where all crystals are aligned by the earth's magnetic field in the same direction. Here, the fired soils become weak "magnets" and exhibit remnant magnetization. It is this change in the magnetic state of the soil (ceramic, hearth, etc.) which causes the magnetic field distortion associated with remnant magnetization.

The second state (unaligned state) in which the iron oxide crystals can be frozen is the unaligned state. In this state the crystal's susceptibility has been altered (increased) but no crystal to crystal alignment has occurred. The net result is increased susceptibility without remnant magnetization.

The magnetic susceptibility alters the earth's magnetic field directly in a manner analogous to the way porosity alters the flow of water through a solid. That is, where the magnetic susceptibility is large (high porosity) the magnetic field is increased and where the magnetic susceptibility is low (low porosity) the magnetic field is decreased. Many cultural objects and processes (fire and heating, biochemical processes, physical and mechanical) locally increase the susceptibility of the native soil. Local changes in site magnetic susceptibility distort the earth's magnetic field and it is this distortion that is mapped. When the difference (contrast) in magnetic properties, combined with size and depth of archeological features are favorable,

the archeological record can be mapped successfully. At the Quartermasters Depot Dump we are concerned with all the above issues.

TWIN ELECTRODE RESISTANCE SURVEYS

Twin electrode resistance surveys measure the distortion of an induced electric field caused by the subsurface archeology (Clark 1990). A current is injected into the ground to generate an electric field in the subsurface. If the soils are completely uniform, a constant field distribution causes a constant reading in the resistance meter. The resulting map will be featureless.

When the archeological record differs from the background geomorphology in salinity, resistivity, density, moisture content or soil type (or combinations of these properties), the induced electric field is no longer uniform and the resistance meter reading will increase or decrease accordingly. When the difference (contrast) in electrical properties, combined with size and depth of archeological features are favorable, the archeological record can be mapped successfully. At the Quartermasters Depot Dump, we are concerned with all the above issues.

SURVEY DESIGN AND IMPLEMENTATION

All area surveys were performed in 20 x 20 m grids or units. The sites were divided into these units by means of a total-station survey. Grid subdivision for data sampling was performed by rope tapes marked in one m increments.

MAGNETIC FIELD GRADIENT SURVEYS

The magnetic field gradient surveys were performed at eight data samples per square meter density (eight data samples per meter in the north-south direction and one data

sample per meter in the east-west direction). There are 3200 samples of the measured magnetic field gradient in each 20 x 20 m grid. The survey instrument was a Geoscan Research (UK) FM-36 Magnetic Gradiometer operated in the 1.0 and 0.1 nT sensitivity range (site dependent) (Figure 4.1).

TWIN ELECTRODE RESISTANCE SURVEYS

The twin-electrode resistance surveys were performed at two data samples per square meter density (two data samples per meter in the north-south direction and one sample per meter in the east-west direction). There are 800 samples of the measured resistance in each 20 x 20 m grid. The instrument electrode spacing was also set to ½ m. This setting provides a survey between about 0.2 and 0.8 m depth (depending on object contrast, size and depth). The survey instrument was a Geoscan Research (UK) RM-15 Advanced Resistance Meter. It was operated at 100 v output, 0.1 ma current, 137 Hz, in the mid-integration mode to insure less than two percent uncertainty in data value (Figure 4.2).

DATA PROCESSING AND DISPLAY

All maps have been edited for defective data and collection instrument or survey procedure defects. Editing consists primarily of throwing away obviously "wild" data and most data beyond three standard deviations (SD). Instrument and survey procedure defects are removed by means of special purpose algorithms (provided by the instrument maker). In the resistance surveys this consists of grid edge-matching as required (seldom) for cosmetic value. In the magnetic field gradient surveys, this consists of adjusting the low-signal mean of each 20 m (about 15 seconds survey time) data traverse to zero. This removes the slow (hours) drift associated with FM-36's internal electronics.



Figure 4.1: Magnetic field gradient survey at Fort Laramie National Historic Site Quartermaster Dump. Operator carrying Geoscan FM-36 instrument. Note ropes laid on ground in one m grid.



Figure 4.2: Twin-electrode resistance survey at Fort Laramie National Historic Site Quartermaster Dump. Operator carrying Geoscan RM-15 instrument. Note ropes laid on ground in one m grid.

SURVEY RESULTS

The principal findings are summarized in the following series of discussions. These are arranged in the logical sequence developed as the survey progressed.

SOIL RESISTANCE MAP (Figure 4.3)

This soil resistance map covers the original area proposed for survey (see Chapter 1), 200 x 40 m, with portions of three additional 20 x 20 m grids extending the area to the riverbank. The dark areas are those regions of high soil resistance, primarily, and almost exclusively, those areas where the Pleistocene river cobbles were exposed on the surface. Lighter shaded areas are those of decreasing soil resistance. Note the appearance of the known homesteading era irrigation ditches (see Chapter 1).

SOIL RESISTANCE AND GRADIOMETER MAP (Figure 4.4)

This map shows the same coverage as the previous, but with the magnetic gradient survey superimposed over the soil resistance map. The intensity of shading representing the resistance levels has been changed, reflecting a finer gradation between intensity levels. The magnetic gradient survey is represented by the series of white "dots" where each dot represents a "hit" with the

instrument. The magnetic gradient results could have also been presented in the shaded manner as the resistivity. However, since each "hit" actually represents a metal object, and not a naturally occurring magnetic anomaly, this presentation is more graphic. Note the lack of correlation between areas of resistance and concentrations of metal. This suggests the placement of the metal artifacts over the project area is unrelated to the underlying (or covering) sediments. Also note how the metal artifacts appear concentrated in certain circular or block areas. This suggests individual dump episodes or piles of artifacts.

As stated earlier, one goal of the geophysical survey was to locate any structural remains that might be present in the project area. Specifically, we were interested in the so-called Adobe Corral (Chapter 1). One of the original ideas was that the various elevated irrigation ditches might have been constructed over the top of a mound representing the corral, with the southwest corner being the intersection of the southeast-northwest ditch and the northeast-southwest ditch. If this intersection was the corner, and based on the results of the geophysical survey over the original grid area, we realized the cover-

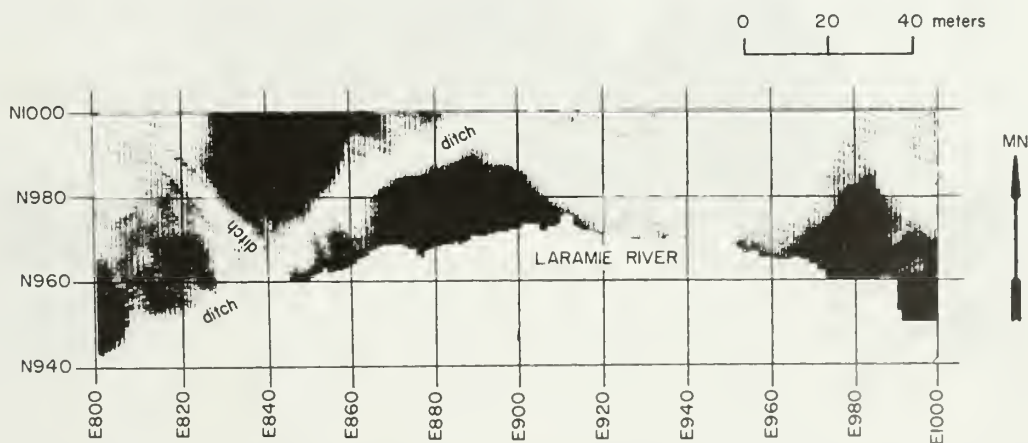


Figure 4.3: Soil resistance map of original geophysical survey area, Fort Laramie National Historic Site Quartermaster Dump Project Area.

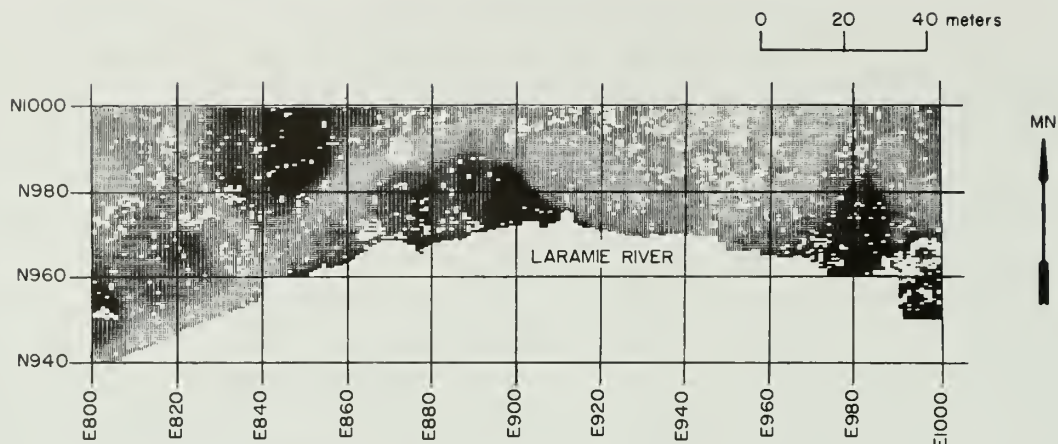


Figure 4.4: Superimposed soil resistance and magnetic gradient maps of original geophysical survey area, Fort Laramie National Historic Site Quartermaster Dump Project Area.

age had to be expanded north and west if any structural remains of the corral were to be found.

EXPANDED SOIL RESISTANCE MAP (Figure 4.5)

The geophysical survey grid was therefore expanded 40 meters west and 60 meters north. This allowed for an area that should have encompassed the adobe corral. The soil

resistance related to the irrigation ditches is clarified and the ditches more easily seen. It is also apparent a large linear shaped area of high resistance is present in the area that would be inside the corral if the ditch intersection was the southwest corner of the corral.

EXPANDED SOIL RESISTANCE AND MAGNETIC GRADIENT MAP (Figure 4.6)

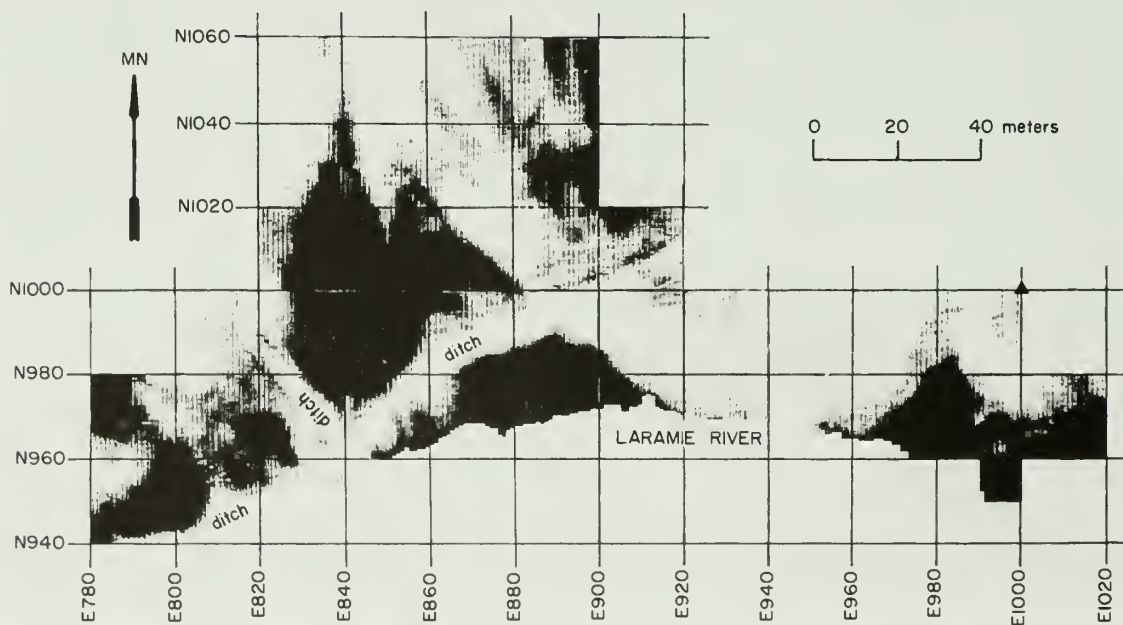


Figure 4.5: Soil resistance map of expanded geophysical survey area, Fort Laramie National Historic Site Quartermaster Dump Project Area.

Again, the results of the magnetic gradient map are overlain here onto the soil resistance map. The area of high soil resistance is shown to have relatively few metal artifacts, but on the north corner of this area, the intensity of metal artifacts increases. However, note here that the artifacts are not concentrated in distinct areas but are scattered over the area. Only in the two northwestern most 20 x 20 m grids can three areas of artifact concentrations be seen. Note also here the high concentrations of artifacts on the southeast corner of the project area. Geomorphically, this area is at the base of the upper terrace slope leading from the Laramie River, a convenient place to which a vehicle could be backed and to discharge a pile of artifacts. This area is out of sight of the fort proper, and would meet the demands of the various post surgeons (see Chapter 1).

**EXPANDED SOIL RESISTANCE MAP
WITH ADOBE CORRAL OVERLAY**
(Figure 4.7)

The 1870 military map of Fort Laramie

depicts the Adobe Corral at its peak of development (Figure 5.8). Assuming the entire adobe corral was still present within the survey area, an overlay of this 1870 depiction of the corral was placed onto the soil resistance map, by aligning structure in the resistance map to the outline of the corral. While the original idea was the southwest corner of the corral would be near the intersection of the two irrigation ditches, alignment of the corral here did not provide any meaningful interpretations. Here, the main area of the corral encloses the area of high resistance seen in the middle of the survey area. While the affects of post-military occupation on surface soils here cannot be determined, one can postulate that surface soils were removed from this area by ten or more years of livestock kicking around loose sand and dirt. Interpretations can be expanded to suggest the area of high resistance between the southeast corner of the structure and the river resulted from similar livestock travel through the gate in the wall to the

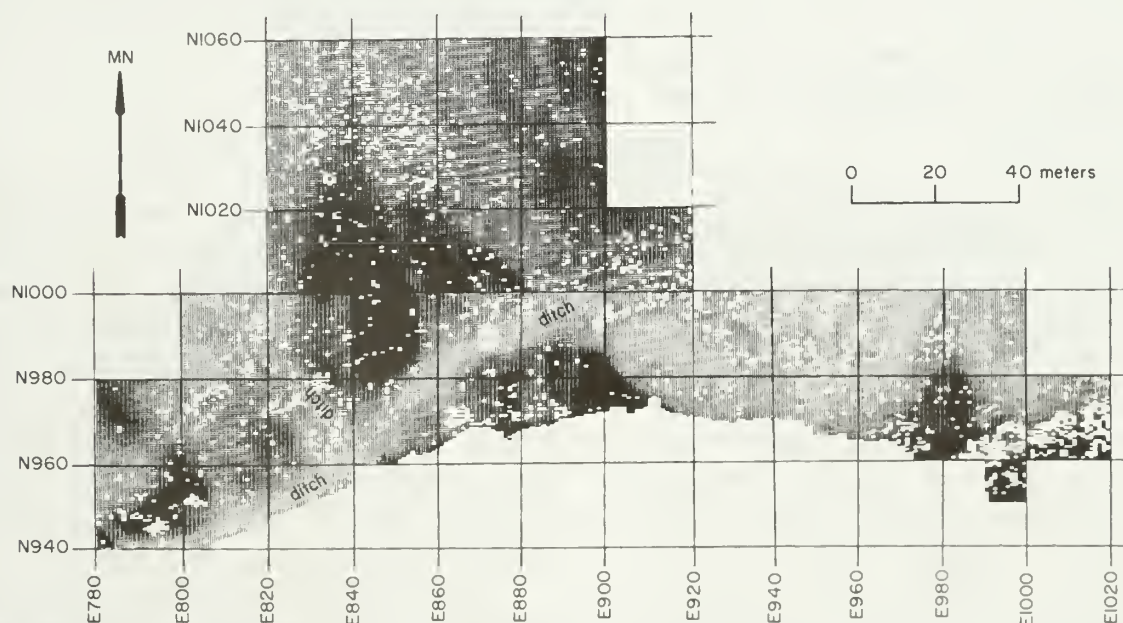


Figure 4.6: Superimposed soil resistance and magnetic gradient maps of expanded geophysical survey area, Fort Laramie National Historic Site Quartermaster Dump Project Area.

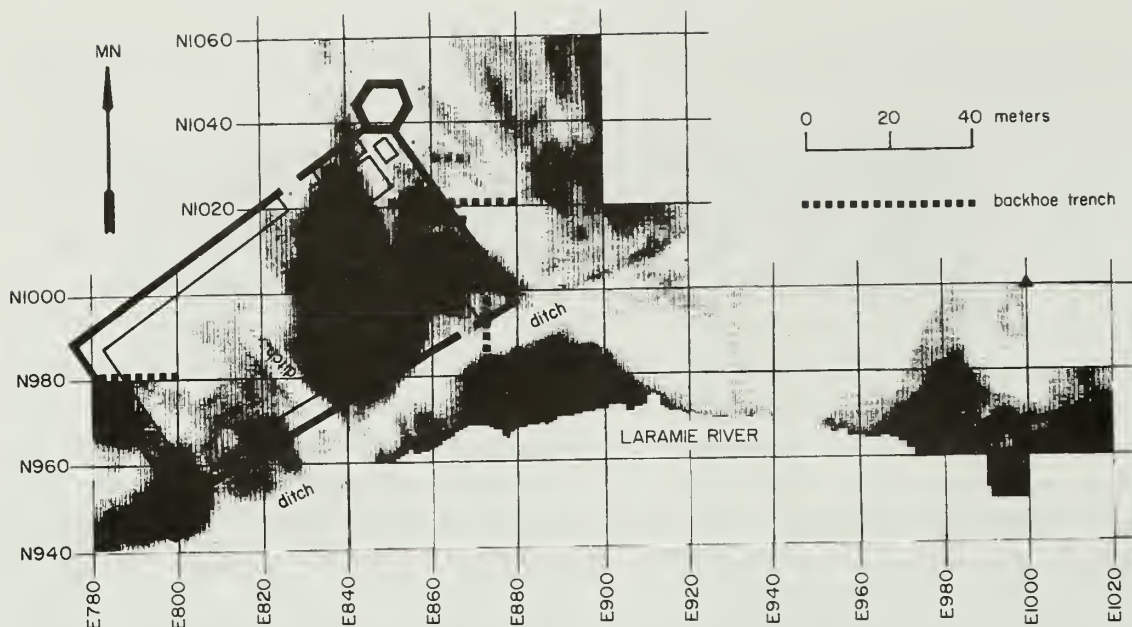


Figure 4.7: Soil resistance map of expanded geophysical survey area, overlain by postulated location of 1870 Adobe Corral, Fort Laramie National Historic Site Quartermaster Dump Project Area.

river for water. The only reason for the area of less resistance between the structure and the river can be attributed to the construction of the elevated irrigation ditch in the 1890s after the military abandoned the fort. The southwest corner of the structure (the attached bastion used for teamsters' quarters) here is placed over an area that shows surface evidence of a deteriorated structure and collapsed fireplace.

EXPANDED SOIL RESISTANCE AND MAGNETIC GRADIENT MAP WITH ADOBE CORRAL OVERLAY (Figure 4.8)

The 1870 Adobe Corral depiction was also overlaid onto the combined soil resistance and magnetic gradient map. Here, the distribution of metal artifacts aids in the interpretation of the corral being in this position. Note the concentration of artifacts near the southwest Bastion, indicative of some form of structure or feature. Also the large number of artifacts located in the north end of the survey area appear to be concentrated in the area within the Adobe Corral

that contained several teamster workshops. Block excavations in this area might reveal evidence as to whether these represent workshops or trash dump episodes. This map also shows the locations of the various backhoe trenches (Chapter 6) that were excavated attempting to intersect the structure walls, based on this overlay.

CONCLUSIONS

The above predicted location for the Adobe Corral was based on the assumption the adobe corral was still intact and remnants present within the study area. Using that assumption, the scenario described above for the location of the Adobe Corral based on the remote sensing appeared valid. However, with continued archeological fieldwork in 1996, a different interpretation on the location of the Adobe Corral was developed (see Block Excavations, Chapter 8, below).

Based on the geophysical survey, block areas along the riverbank were defined for archeological excavations (Figure 4.9).

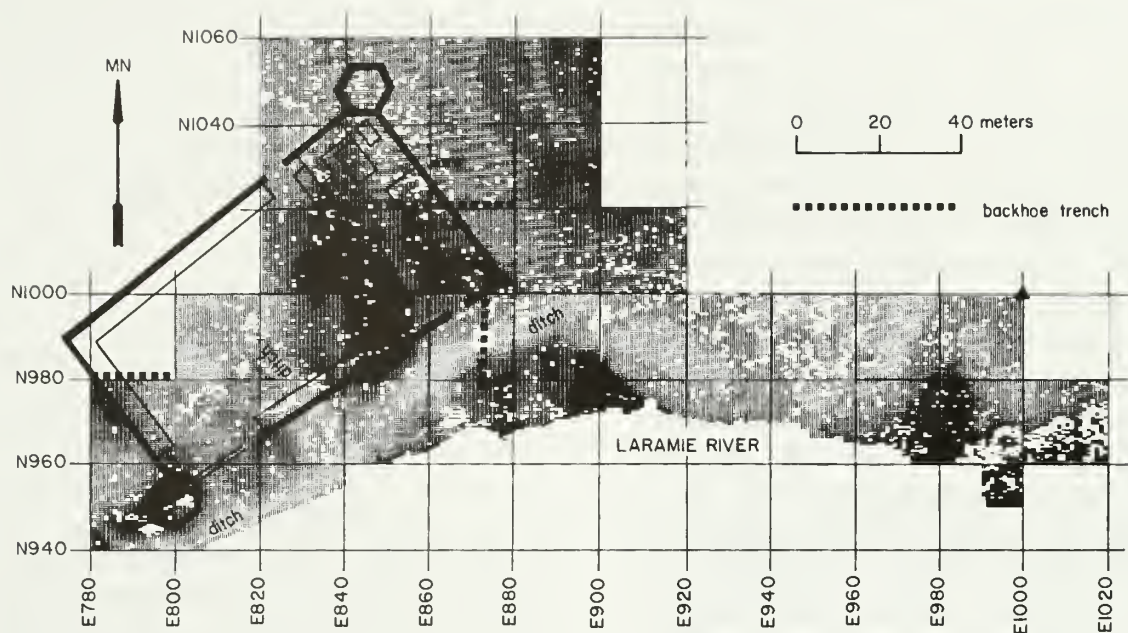


Figure 4.8: Superimposed soil resistance and magnetic gradient maps of expanded geophysical survey area, overlain by postulated location of 1870 Adobe Corral, Fort Laramie National Historic Site Quartermaster Dump Project Area.

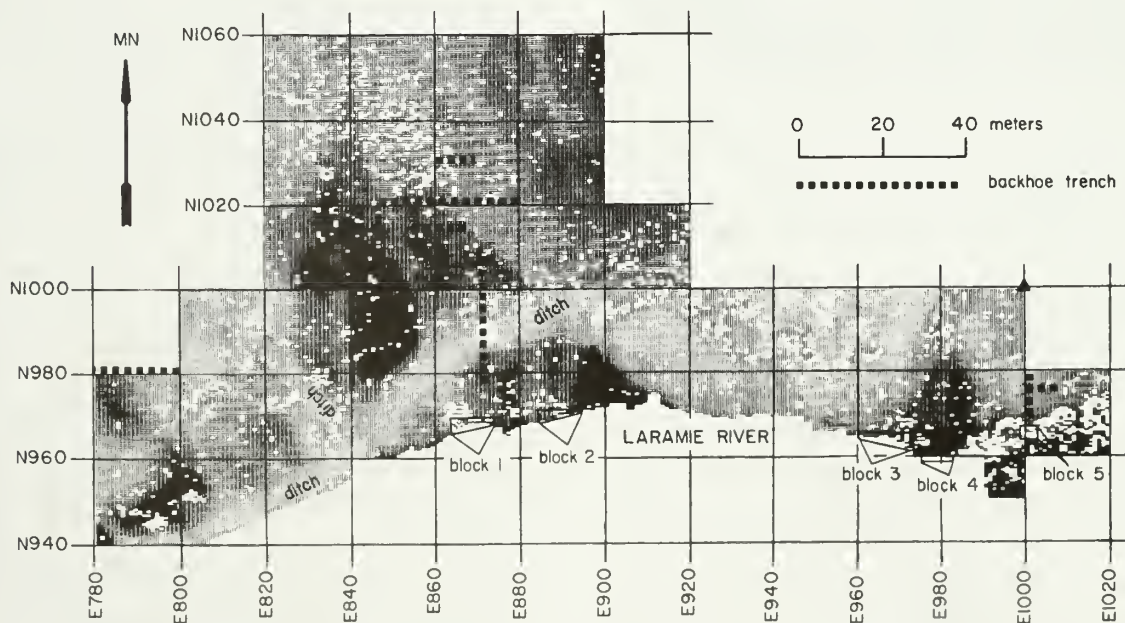


Figure 4.9: Superimposed soil resistance and magnetic gradient maps of expanded geophysical survey area, showing block excavation areas and backhoe trench locations, Fort Laramie National Historic Site Quartermaster Dump Project Area.

These five areas were selected based on the high concentration of metal artifacts near the riverbank. These artifact concentration areas, along with the riverbank survey results (see Chapter 7) suggested these areas held the greatest potential for in situ artifact material that was in danger of eroding into the river. One other block area was established over the large anomaly near the center of survey grid block N980-100/E860-880.

In general, the resistance and magnetic field gradient surveys at the Quartermaster Depot Dump were successful. The goals set forth in the research design were met. Artifact materials along the river bank were identified and mapped in the magnetic surveys. Architectural features were found in both the magnetic and resistance surveys. Areas of low and high artifact concentrations were identified and mapped. No Native American campsites were identified. This deficiency may result from their absence in the area, or if present, their not being recorded could be improved with additional magnetic data analysis and modeling.

CHAPTER 5

GIS DATABASE GENERATION OF SPATIAL-HISTORIC STRUCTURE DEVELOPMENT AT FORT LARAMIE

by
William S. Woods

INTRODUCTION

Fort Laramie, situated on the Laramie River in southeastern Wyoming, presents modern visitors with a remarkably preserved remnant of United States military expansion into the Great Plains. Many historic structures and structural remains occupy the site, offering historians and historical archeologists substantial resources with which to study the past. Additionally, a series of maps produced annually by the post quartermaster during the military occupation provides modern scholars with information regarding the distribution of structures no longer present on the site surface.

In principle, these quartermaster maps can be used to aid researchers in finding buried artifacts associated with missing structures, even when there is no visible trace on the ground. However, difficulties arise with modern location attempts based on the historic maps. The maps contain large planimetric error, which can be described as spatial inaccuracy and displacement. Modern location of archeologic materials is problematic because of the planimetric discrepancy between the historic depiction and actual modern locations of existing buildings. This inability to correlate information contained in

the historic maps with modern ground location forces site managers and scientists to work within a framework of great uncertainty.

This study seeks to integrate the historic maps and a modern EDM (Electronic Distance Measure) surveyed base map into a GIS (Geographic Information Systems) database, particularly with reference to structures located along the Laramie River within the Quartermaster Dump area. Transfer of direct measurements from these old maps, (using standing structures as reference) yielded inconsistent data concerning the "on-ground" location of the structures, when comparing the results of the geophysical remote sensing.

Within this database, spatial transformations may be carried out upon the information presented in the historic maps. A systematic application of these transformations will achieve significant correction of the structural distribution information portrayed. These corrected maps should offer site managers and scientists a greater ability to ascertain actual locations of the absent structures. When combined with the geophysical data generated during the Quartermaster Depot Dump Project, these corrected structural

locations become of even more use to the site planners in locating structures present along the riverbank near the dump area.

Correction of planimetric error within the GIS database comprises the technical goal of this project. This correction is based on spatial transformations designed and carried out within the framework of PC ARC-INFO. This vector based GIS was selected for several reasons. ARC-INFO includes a trans-

formation module designed for the shifting of map coordinates from digitizer units (inches) into real world coordinate systems. Additionally, the success or failure of a small GIS system operating on a modest database is an interesting question in its own right, implying upon success that PC based GIS systems can be effectively dedicated toward management and problem solving at particular historic sites. The study demonstrates the

effectiveness of small systems in addressing unusual applications. The hypothesis of this study is that a transformation toward planimetric correction of the historic maps can be achieved on a map to map basis. That is, a single transformation of a single historic map will result in a displacement of map features toward higher spatial accuracy.

Development of a reasonably complete and corrected database of the structural development at Fort Laramie will be highly useful for site management. Spatial queries may be directed toward variables contained within the GIS database. A digitized inventory of all structural development occurring at the Fort will allow for systematic assessment of cultural resource impacts. Ideally, the correction of spatial error occurring in the historic map series will aid field archeologists in locating and extracting cultural materials. Therefore, this project and the resulting database offer a new resource for Fort Laramie site planners, managers, historians and archeologists.

Structural development during the military occupation at Fort Laramie was confused and sporadic.

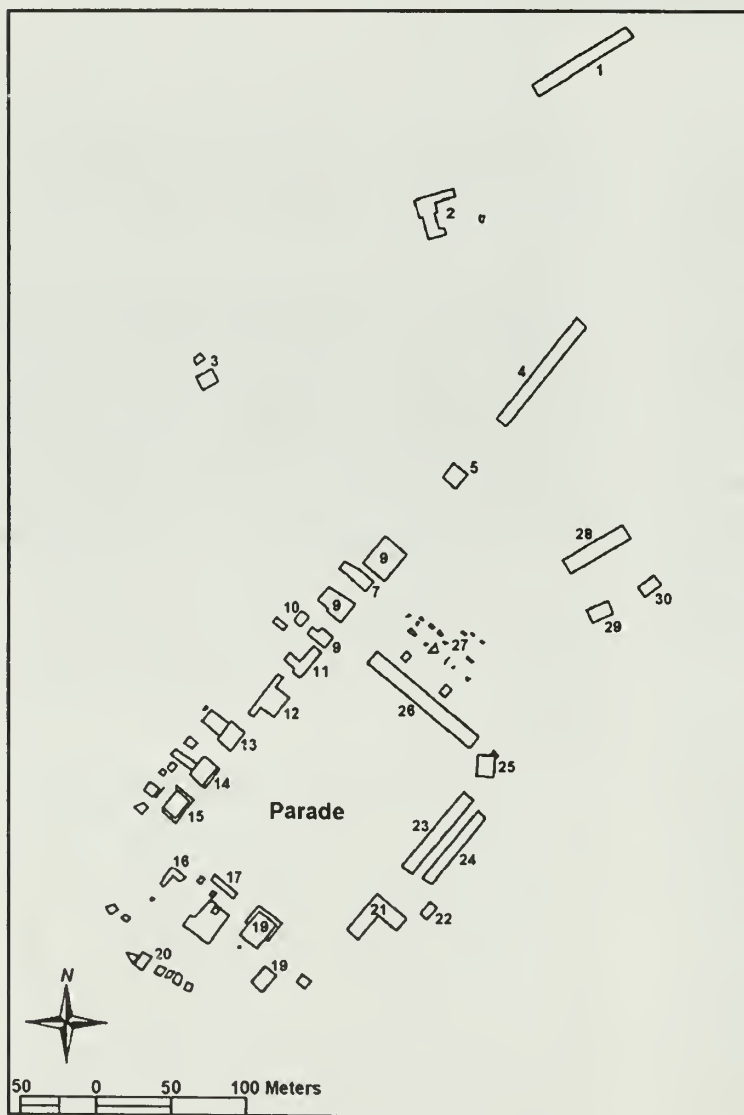


Figure 5.1: 1995 base map of Fort Laramie, showing standing structures, structure remnants and other features. Numbers refer to structures listed in Appendix One.

Original structures were trading forts built of river-bank soft woods. These structures crumbled over the years, usually abandoned when no longer functional. Eventually adobe and masonry structures became the norm for new construction. One hundred and eighty structures were erected over the 41 year military life of the fort. Only a handful of these survive today (Hendron 1942:iii) (Figure 5.1).

Historic maps used in this study are from the years 1851, 1854, 1863, 1867, 1870, 1874, and 1888. Original development of these maps occurred yearly as part of the Quartermaster's inventory of the post. However, most of the maps produced in this forty year series were lost in the years following the abandonment of the fort. Therefore only the maps listed above were available for this study.

The cartographic methods employed by the Quartermaster probably relied on use of the plane table and chain measurement. The plane table, developed in the late sixteenth and early seventeenth centuries in response to the needs of surveyors, featured a flat square board, operated horizontally, and turned on a universal joint from a tripod stand. A piece of paper would be attached, and bearings could be easily marked by using the alidade, a sighting instrument. Maps were sketched in the field. The plane-table, with chains for measuring distance, offered the fort surveyors a straightforward means of surveying and avoided much of the mathematical calculation inherent in other methods (Bennet 1987:46-49). This historic methodology has important bearing on modern map correction techniques, implying error, when it occurred, was probably not due to any broad-scale mathematical mistakes.

PURPOSE AND OBJECTIVES

One purpose of this study is to facilitate management and planning, including archeologic investigations, at Fort Laramie. Additionally, this study seeks to learn if meaningful correction of planimetric error within the historic maps can be attained through a one to one transformation process. This will be achieved through GIS analysis and modeling. Specifically the objectives are to use modern technology (GIS, PCs, EDM) to:

1. Digitize and edit a sequence of historic maps.
2. Survey and construct a modern, spatially accurate base map of surficial cultural features.
3. Relate the historic database to the modern base map.
4. Test and confirm the veracity of the resulting database (through GIS comparison techniques, including overlay operations).
5. Produce from the tested, corrected database a series of maps, including:
 - A. Historic maps of all years available, showing spatial distributions for those years.
 - B. A series of maps comparing the original historic maps with the transformed maps.
 - C. A series of maps comparing the original historic maps with the 1995 map.
 - D. A series of maps comparing the 1995 map with the transformed historic maps.
 - E. The transformed historic maps with a 100 meter UTM grid.
 - F. The transformed historic maps demonstrating control coding.
 - G. A composite image of structures from the modern base map

and the transformed historic maps.

Ideally, these objectives will provide a complete and accurate digital database of the site.

LITERATURE REVIEW

Although many scientific studies address the application of GIS technology for archeologic study, resource management, and site planning, the particular application of GIS in the integration of historic maps for constructing a cultural database is relatively new. Only Scott (1991) addressed this topic in particular. That study, (Scott 1991) bears a remarkable resemblance to the goals of this project, though it differs broadly in terms of scope and methodology. Additionally, several sources exist discussing the history and development of Fort Laramie. These histories, although of limited bearing on this study, offered certain chronologies and visual descriptions of structures no longer in existence.

METHODOLOGY

MAP SELECTION, PREPARATION, DIGITIZING, EDITING AND LABELING

The historic maps for 1851, 1854, 1863, 1867, 1870, 1874, and 1888 were selected and prepared. The process of preparing the maps for digitizing consisted of transferring the map features from the historic maps to mylar. In the mylar transfer, map features were traced by hand onto overlaid mylar sheets. By transferring the maps to mylar certain map features were clarified, the copies could be freely annotated, bordering blank map space could be trimmed for digitizing purposes, and the maps themselves could be better preserved on more static media.

Following the mylar transfer, all maps were digitized, using the ARC-INFO ADS (Arc Digitizing System) platform. Digitizing

consisted of the placement of the mylar maps onto a digitizing tablet, after which previously selected tics were input as part of the map registration process. The initial tic registration process within ADS is essential in instances where map digitizing is not completed within one session. Tic registration allows the map to be repositioned on the digitizing board with great accuracy, an operation that might otherwise become a source of considerable digitizing error. However, in only one instance were any of these historic maps digitized over multiple sessions.

After tic registration and the input of map boundaries, the actual digitizing commenced. Point-mode digitizing was selected because of the structural nature of most map features. Point mode digitizing allows for the input of individual points from the map, and these points are in turn linked by straight arcs. Given that most structures consisted of largely straight-line architecture, point-mode digitizing offered the best method for capturing the feature dimensions in an expedient manner. For natural features, such as river banks and bluff lines, sufficient input points using point-mode digitizing effectively captured their curvi-linear character. Another advantage of point-mode digitizing relates to data storage and retrieval. By its nature, point-mode digitizing requires substantially less data storage than stream-mode, the other digitizing option. Because of this, point-mode digitized coverages use less disk space and can be used for ARC-INFO operations more quickly.

All structures were digitized in a clockwise manner, overshooting the final arc intersections. That is, the final arcs were deliberately extended past intersection to be sure of complete polygons. It is axiomatic in the editing phase of digitizing (which takes

place in ARCEDIT) that it is far easier to remove excess arcs than to add them. Circular structures, such as ice-houses, Native American lodges, and wells presented difficulties using point-mode digitizing. However, these structures occurred rarely enough for small inaccuracies to be disregarded.

In the final stage of digitizing, maps were saved in ADS. Then, back within ARC-INFO proper, the new "coverage" was "cleaned" using the ARC-INFO command CLEAN. Cleaning an ARC-INFO coverage has the effect of creating nodes at all intersections and establishing arc topology. At this point, maps entered the editing process.

ARCEDIT, a graphic editing interface, was used for the process of correcting the newly digitized coverages. The editing process consisted largely of selecting and deleting "overshoots," denoted in red squares as dangling nodes. Because the previous CLEAN operation placed nodes at all intersections, deleting the dangles left square corners. Very occasionally, an "under-shoot," or gap, needed correction by adding arcs or moving nodes within ARCEDIT. The coverages were then cleaned again, and ARCEDIT used again to delete the new dangles. Immediately following every ARC-EDIT session the coverage was cleaned again, reestablishing correct arc topology.

ARCEDIT was again used for the labeling objective. User identification numbers were input and associated with particular polygons by mouse operation within ARC-EDIT. All polygons on all coverages were labeled in this manner. After cleaning again, ARC-INFO TABLES, a text-based database platform, was used to associate structure names or descriptions for all polygons. These structural identifiers were extracted from key information present on the original historic maps. The result of this operation

was to include these identifiers within the PAT (Polygon Attribute Table) for each coverage. This labeling process concluded the objective of selecting, preparing, digitizing, editing and labeling the historic maps.

SURVEY AND CONSTRUCTION OF A MODERN BASE MAP

A modern base map was surveyed over a four day period in July of 1995 using an EDM survey instrument (Figure 5.1). Survey methods included the labors of three surveyors, with one surveyor operating the EDM instrument while the other two ranged the site with prism rods. Over a thousand data points were located into UTM (Universal Transverse Mercator) coordinates. The EDM also provided elevation information for all data points.

Surveyors recorded historic and modern structure data by shooting locations for all structure corners. Additionally, ruins, foundations, and depressions were recorded with prism-rod operators making field judgements on likely dimensions. Depressions in particular, probably created by collapsing cellars, were approximated to rectangular shape. Central elevation data for most ruins, foundations and depressions were also recorded. The EDM survey included natural features as well, such as both banks of the Laramie River, ridge and bluff lines, and general topographic shots. Additionally, extensive measurement was made of post military water trenches running throughout the fort.

Inclusion of the EDM data-set into PC ARC-INFO became problematic. Before attempting to input the set using ARC-INFO GENERATE, it was necessary to edit out certain data-set members superfluous to the base map data needed for this study. These included elevation and annotative information. To streamline the process, several programs in the C programming language

were written and compiled. These programs operated on the EDM data set, an ASCII text file, removing the unneeded members and assigning point identification numbers to all sets of UTM coordinates. This process allowed the data-set to be input into ARC-INFO as a point coverage, meaning all data points from the survey were represented as points. Additionally, EDM coordinates needed to be reversed from the standard UTM northing-easting system, to x-y coordinates for ARC-INFO. Hard-copy printing of these coverages then allowed manual plotting of structure polygons based on the layout of data points. This was followed with composition of another C program for isolating members of the data-set based on user input. This allowed for the eventual construction of dozens of files, each representing one or two structures, which were in turn input into a final base map coverage.

PLANIMETRIC CORRECTION OF HISTORIC MAPS

By the hypothesis developed for this project, initial attempts at planimetric correction involved a one to one transformation of historic maps onto modern base map coordinates. This began by selecting tics on the historic maps that could be linked to modern locations, such as structure corners. Creating corresponding tics on the modern map allowed for the ARC-INFO operation TRANSFORM to be used in shifting the historic map to match spatial aspects of the modern base map.

The difficulty involved in such a one to one operation became immediately apparent. The use of few tics could link certain structures in the tic area, yet left other structures on the map surface wholly unrelated (Figure 5.2). To get around this problem, a wide range of tic combinations was attempted, and even more tics added to the transformation

process. Unfortunately, despite a myriad of tic combinations applied to the transformation process, correction for the entire map plane could not be achieved. Additionally, the use of more tics tended to introduce overwhelming skewness into the map features (Figure 5.2). Clearly the historic maps demonstrated considerable planimetric error. The study at Fort Niagara (Scott 1991) faced similar difficulties, and offered suggestions for dealing with the problem.

Survey methodology in the years of the Fort Laramie map production consisted largely of the use of plane table, measuring chains, and theodolite (for bearing). The Fort Niagara study indicated map error would be at its greatest on a map wide scale, while smaller clusters of structures could retain fair accuracy (Scott 1991:323-326).

At this point, the initial hypothesis was judged to be false. Correction of planimetric error could not be achieved based on base map to whole historic map transformations. A secondary hypothesis was therefore developed, along with a new methodology to achieve the technical goal of this project: correction of the historic map sequence. The secondary hypothesis was that a transformation toward planimetric correction could be achieved on a section by section basis. That is, multiple transformations of sections of a historic map will result in a displacement of features toward spatial accuracy.

The secondary hypothesis relies on approaching the planimetric error present in the historic maps piecemeal, by dividing all map coverages, including the modern base, into eight zones. This operation included building a split-cover, a polygon coverage used as a "cookie cutter" to divide the base map into smaller coverages. Comparing each zone to the corresponding area on the historic maps allowed for a trial and error transformation

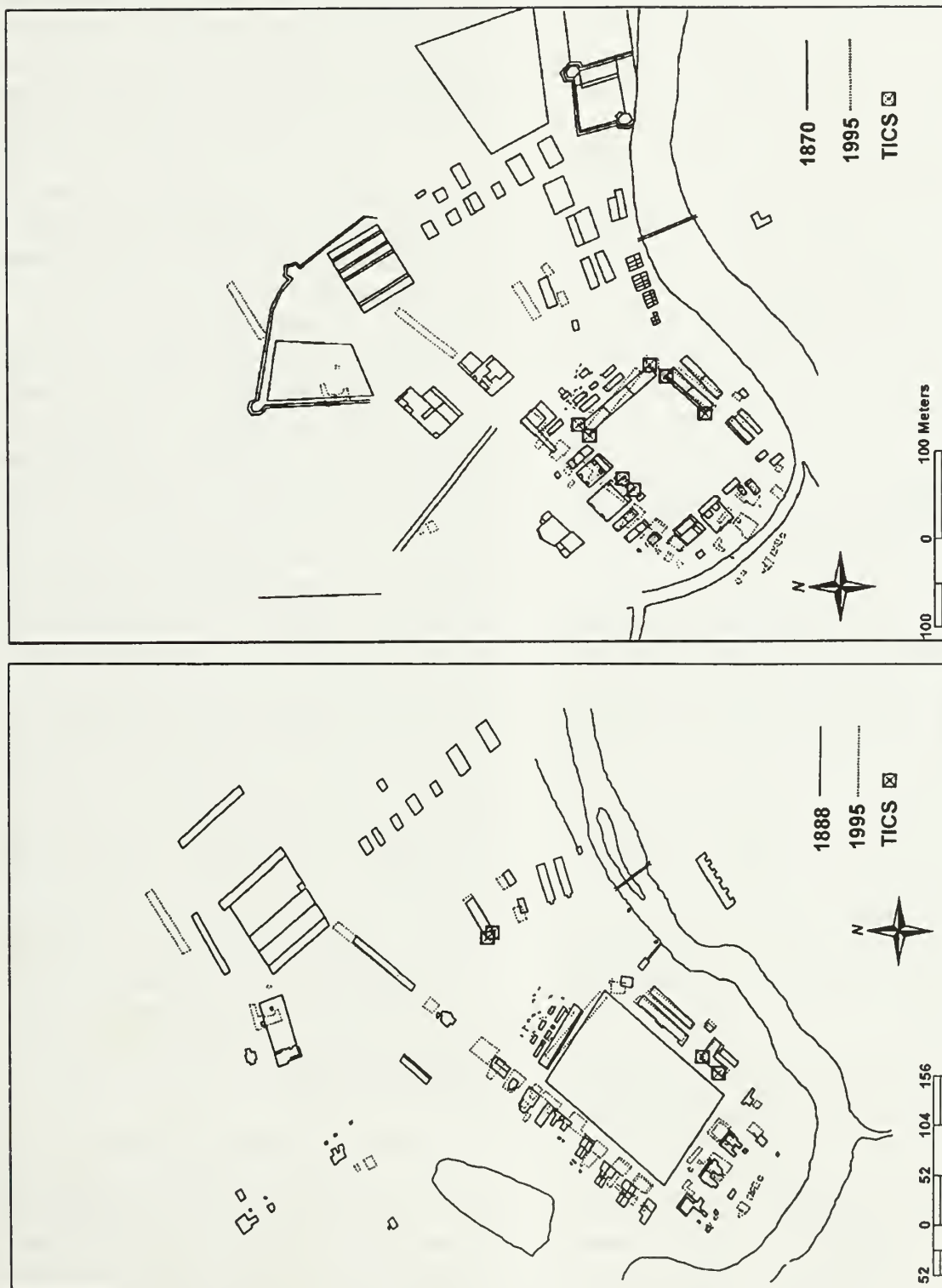


Figure 5.2: One to one transformation of historic maps with 1995 map, showing tic points and skewness. Left: 1888 transformation. Right: 1870 transformation.

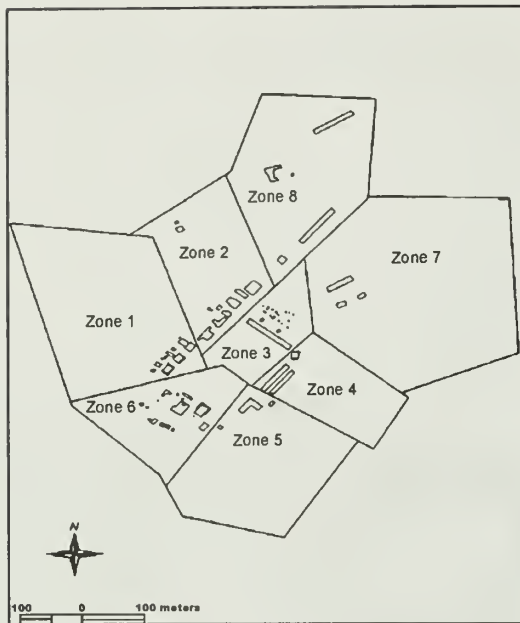


Figure 5.3: 1995 base map with split cover.

process to occur. The historic map was compared and linked to the particular zone, a best transformation fit determined, and the entire map transformed centered on the zone. The split-cover was then used to cut the matching zone from the historic map. This methodology essentially treated each historic map as eight sub-maps, offering a much finer degree of control over the transformation. Following completion of all eight zones, the pieces of the map were then placed back together using the MAPJOIN command (Figure 5.3).

The ARC-INFO TRANSFORM module was designed for shifting, rotating and scaling map features from digitizer units (inches) into the desired map coordinate system. TRANSFORM uses an affine transformation process as a default when at least three tics are used in the transformation process. When two tics are used, TRANSFORM bases the transformation on similarity calculations. Frequently, throughout the transformation of the historic map sequence, only

two tics were used, because two tics offered the best visual transformation results, or because use of more than two tics caused severe skewing in the transformed sections. Therefore the transformed historic maps most often represent a combination of affine and similarity transformation processes. This method of transformation allowed for a much higher degree of correlation between historic and base map, and eventually between historic and historic map.

An unfortunate side effect of the split cover method was the destruction of large natural feature contiguity. The Laramie River bank, in particular, suffered many breaks and distortions. Because of this distortion of natural features, it became necessary to discard most of them. The value of the natural features was questionable regardless, because of the potential they offered for error in the original surveys. Depending on the survey methodology, river banks (for instance) could have been surveyed to water line, outer bank edge or inner. Changing water levels also would introduce error into these measurements, and, along with channel migration over the last hundred years, introduce a high level of uncertainty into the usefulness of comparing historic banks with the modern. The transformation process itself sometimes also introduced skewness into rectangular map polygons, causing them to form parallelograms, spikes, and triangles.

MAP TRANSFORMATIONS

The methodology described above was used to transform and achieve planimetric correction of the historic map series, based on comparisons with the 1995 map. The degree of transformation is demonstrated by overlaying the original historic maps with the transformed historic maps, for each year.

The sequence of historic map transformations begins with the most recent year, 1888, then proceeds to 1874, 1870, 1867, 1863, 1854, and 1851. Beginning with 1888 allowed the highest correlation of historic structures with the modern base map to be performed first. By progressing from the most recent to earliest, instead of the usual historic order, transformation of structures without modern representation could often rely upon the placement of the same structure in a later map year. Working backwards through the historic maps was the best method for deducing the transformation of missing structures.

The use of magnetic and true north orientation in the historic and modern base map warrants some discussion. Several historic maps show both magnetic and true north directions. The remainder portray only true north. Magnetic north constantly undergoes a natural fluctuation, and because of the wide gap of years between historic maps it could be expected to vary significantly. Transformation of the historic maps to match orientation of the modern base map, which portrays true north orientation, causes the transformed historic maps to take on true north orientation as well. Therefore any discrepancy caused by different orientations is corrected within the transformation process.

TRANSFORMATION OF 1888 MAP

(Figures 5.4, 5.5)

As stated previously, transformation of the 1888 map (Figure 5.4) to the planimetric dimensions of the 1995 Base Map began with splitting the 1995 Base into eight zones (Figure 5.3), resulting in eight separate coverages representing the base map. The transformation began with Zone 2, the area containing the highest density of historic structures. Arbitrarily assigned tics to Zone 2 of 1995 began with corners of Old Bedlam. Corresponding tics were then assigned to the

1888 coverage. Using ARC-INFO CREATE, a coverage containing the tics from Zone 2 of 1995 was created. The final step consisted of transforming the 1888 tics to match the UTM position of the 1995 tics, creating a new transformed 1888 map (Figure 5.5). A visual comparison in ARCPLOT relied on overlaying the transformed 1888 map on top of 1995 Zone 2. By drawing the two maps in different colors, the effectiveness of each transformation was judged. This process was repeated several times with different tics and tic combinations. Finally a series of tics based on the munitions magazine offered what was judged an acceptable transformation. This transformed 1888 map was saved, and Zone 2 extracted using the same split cover used on the 1995 base map.

The transformation of Zone 5 was also achieved using the steps outlined above. Tics were selected from the Administration Building. Zone 4 became problematic, probably because the EDM survey relied heavily upon widely dispersed foundation lines. A series of six tics representing the barracks and the new guardhouse finally created a decent match.

Zone 3 relied solely upon foundation lines in matching the central barracks (a regular feature throughout most of the historic maps). The dimensions of the EDM surveyed foundation lines could only be reconciled by assuming a drastically shortened barracks in 1888 (Figure 5.5). Zone 7 transformed fairly easily by matching the Commissary Building and two bakeries behind it with the same structures on the 1888 map. This area was perhaps the most important because it allowed incorporation of several shop structures to the northeast that have no modern representation (Figure 5.5).

Zone 8 was again problematic and probably reflects high mapping error in the 1888

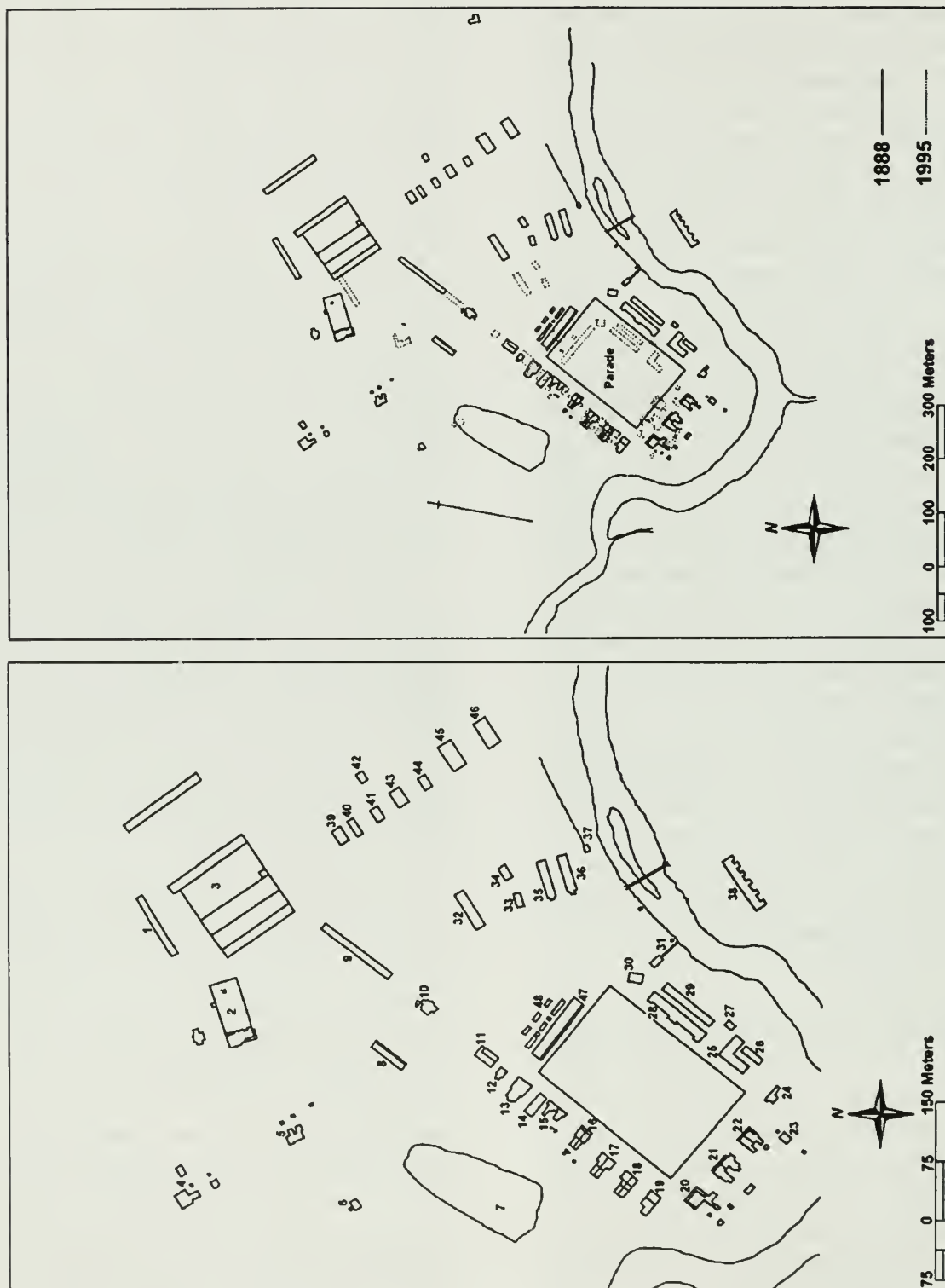


Figure 5.4: Left: 1888 map. Right: 1995 map overlain by 1888 map.

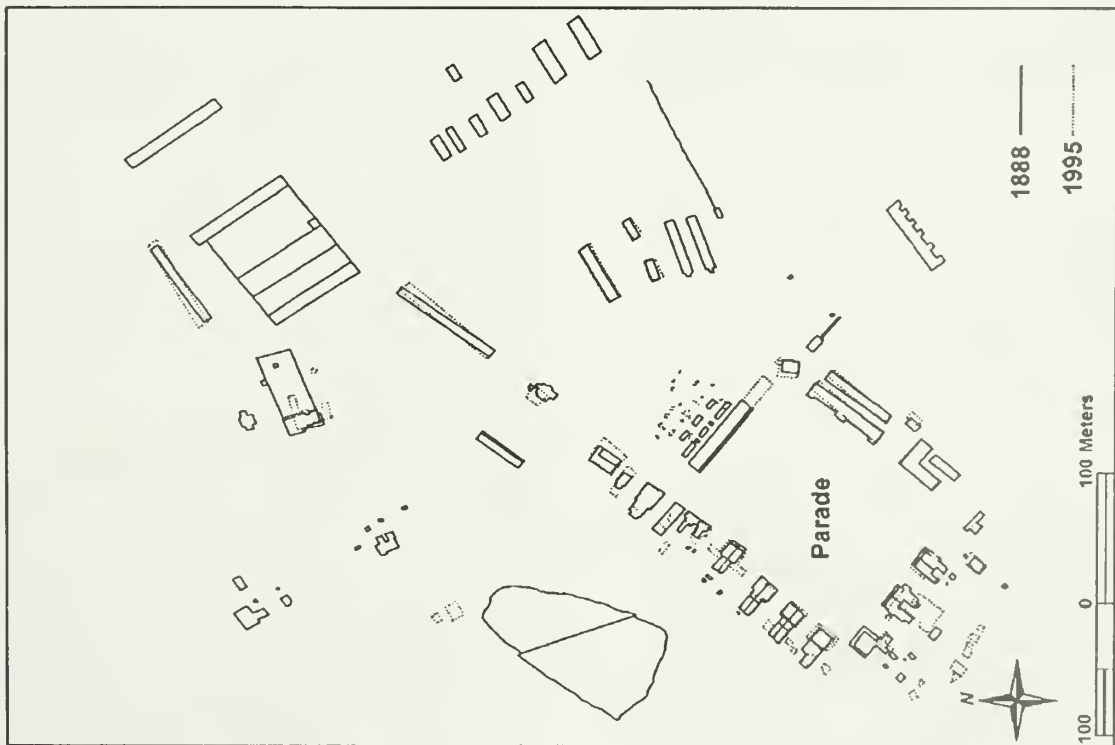
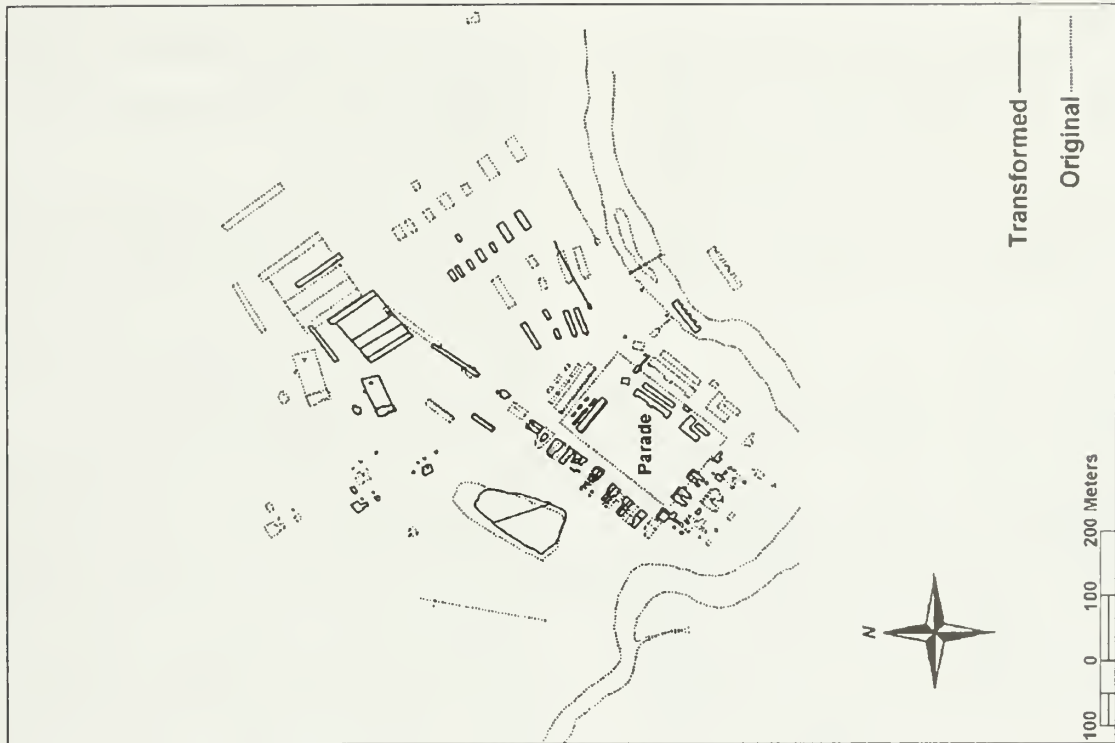


Figure 5.5: Left: Transformed 1888 map overlain on 1995 map. Right: Transformed 1888 map overlain on original 1888 map.

map. Both the new hospital and non-commissioned officers barracks remain as foundation lines and standing walls. The cavalry barracks structure to the southeast has been restored, and offered another immutable link to the 1888 map. In the end, all three structures were used for tic selection to achieve the best fit. This fit was the weakest of all eight zones.

Zone 6 offered some confusion, and represents the most mutable section on almost all the historic maps. This helps account for the large variety of depressions, foundation lines and mounds surveyed on the base map. A probable match was achieved by selecting tics from the restored officers Quarters A. Zone 1 completed the transformation of the 1888 map. This area on the historic map demonstrated much error, with the three evenly spaced officers quarters demonstrating a systematic compression toward Old Bedlam. Placement of tics upon all three structures achieved the desired match.

Upon completion of Zone 1, all the transformed zones were joined using ARC-INFO MAPJOIN. The resulting coverage represented the transformed 1888 map in its entirety, but some steps remained in the process. Because of arc overlap caused by the joining of the eight separately transformed zones, some editing was required to restore clarity to the map. This included deleting overlapping arcs and the removal of most natural features. The completed map was then overlaid with the 1995 map for a comparative view of the whole (Figure 5.5). It was also overlaid with the original 1888 map to demonstrate the amount of planimetric error within the original (Figure 5.5). Distortions as large as 50 m occur at the southwest end of the parade ground, while the quartermaster buildings northeast of the

main fort area appear displaced as much as 100 m.

TRANSFORMATION OF 1874 MAP (Figures 5.6, 5.7)

Following the same process detailed above for the 1888 transformation, the 1874 map (Figure 5.6) transformation began with Zone 2. Tics used for the transformation (again, after much trial and error) were from the front corners of Old Bedlam and the rear corners of the magazine structure.

Zone 4 for the 1874 map transformed easily using four tics selected from the front corners of both barracks. Zone 5 presented for the first time a difficulty occurring throughout this project as it proceeded into the older historic maps. No modern correlatives link with the structures depicted in Zone 5 of the 1874 map. The Zone 4 transformation was used for the Zone 5 transformation as well, based on the proximity of the zones and the high accuracy demonstrated in the Zone 4 transformation. Zone 3 matched the 1874 and base map easily using the four corners of the central barracks. Additionally, the placement of two depressions northeast of the central barracks matched nicely with kitchen structures on the 1874 map, lending validity to the transformation (Figure 5.7).

Zone 7 relied heavily upon the series of shops at the edge of the fort, largely because the three structures previously used for transforming this zone occurred after 1874. Therefore it became necessary to use the transformed 1888 Zone 7 for this section. This technique of relying upon previously transformed maps instead of the 1995 base became more prevalent as the series of map transformations progressed, because of the previously stated difficulty with lack of modern structural representation. Zone 6 of 1874 transformed easily with just two tics,

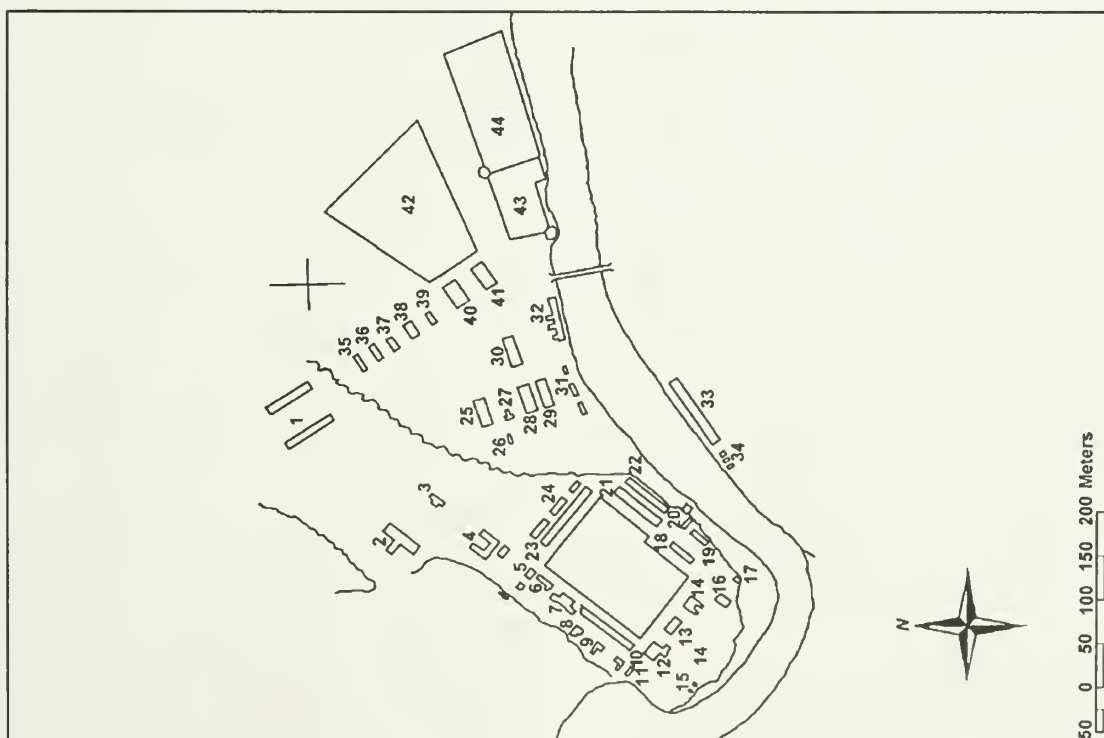
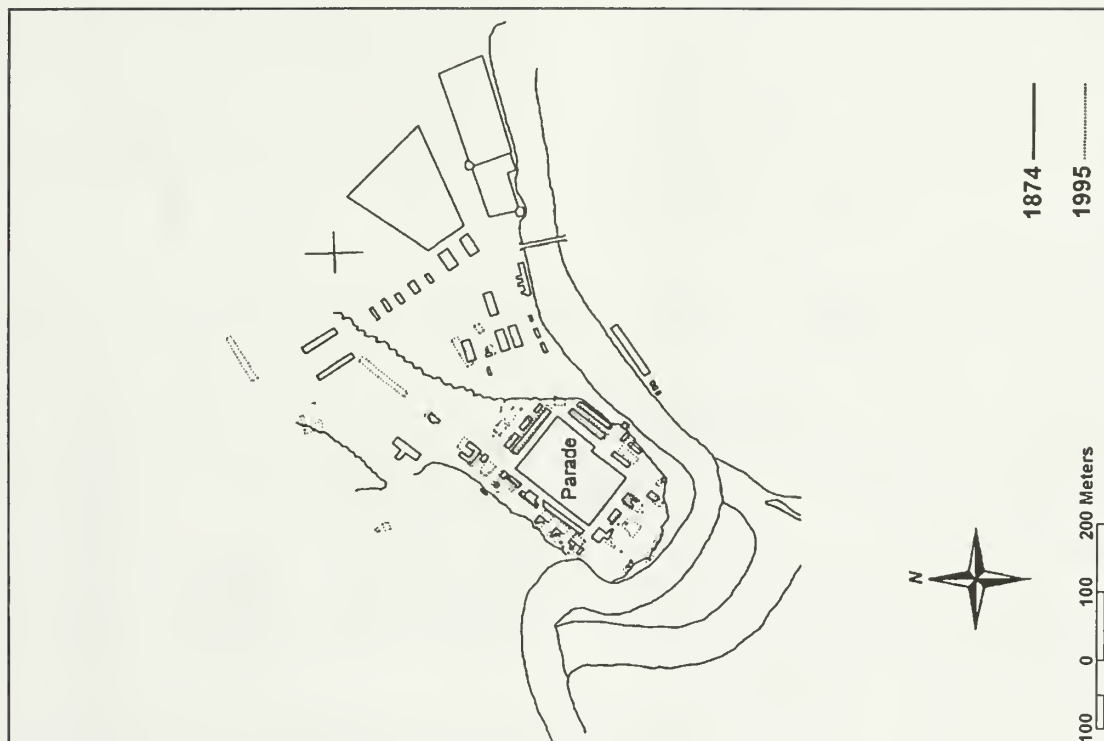


Figure 5.6: Left: 1874 map. Right: 1995 map overlain by 1874 map.

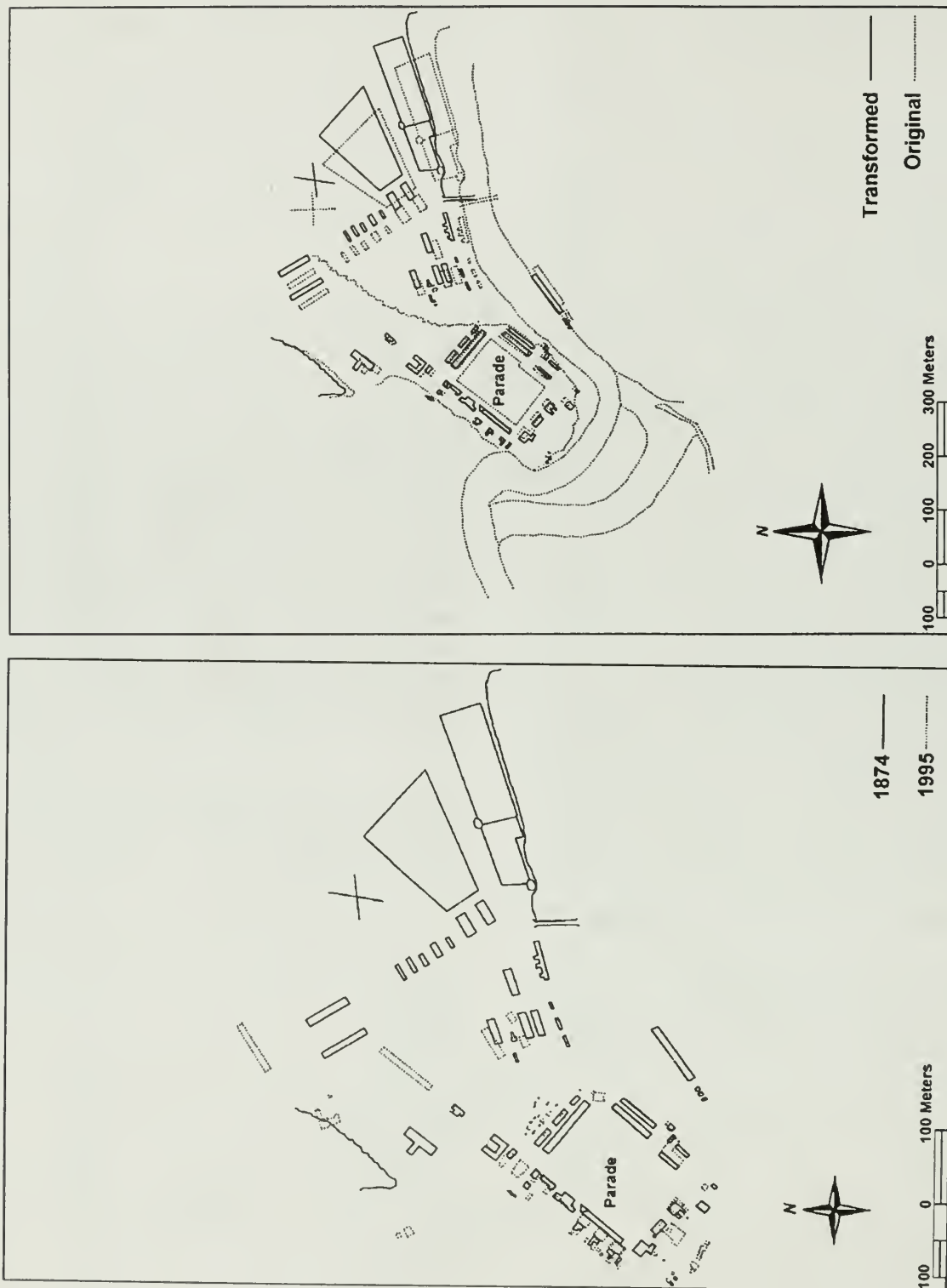


Figure 5.7: Left: Transformed 1874 map overlain on 1995 base map. Right: Transformed 1874 map overlain on original 1874 map.

selected from Quarters A foundation corners. Zone 8 transformed easily using a depression mapped on the modern base map, representing the Sutler's residence. This depression would prove essential as work progressed, becoming the only modern representative of features depicted in Zone 8 on the older maps.

Zone 1 again completed the transformation process, and served as another indicator of problems to come. Although the officers' quarters represented on the series of historic maps changed with nearly every map, their spacing became obviously regular, and therefore predictable. Almost invariably, three structures are depicted as occurring in linear, equally spaced fashion. Although these structures would prove to be built behind, on top of, and in front of each other, the linear spacing remained inviolate.

Completion of the transformation process of the 1874 map was followed by joining all the transformed maps using MAPJOIN (Figure 5.7), and then removing overlapping arcs and natural features. The planimetric error in the original 1874 map is illustrated by overlaying it on the transformed 1874 map (Figure 5.7). Error is small in the area of the parade ground, but increases substantially around the quartermaster shop area to the northeast, appearing displaced as much as 40-50 m.

TRANSFORMATION OF 1870 MAP

(Figures 5.8, 5.9)

Again, Zone 2 was transformed using tics from the Old Bedlam officers quarters. Additionally, tics from corners of the Sutler's store were used. Zone 3 was transformed through the selection of two tics at the rear corners of the central barracks structure. This transformation shows a distortion of the central barracks width as presented in the 1870 map (Figure 5.8). Topological

comparison with the 1874 map shows shortening of the barracks is not the cause of this apparent discrepancy. Zone 4 transformed readily with the selection of four tics on the front of both barracks structures. Zone 5 was transformed from the placement of tics on the new guardhouse.

Zone 6 proved resistant to reasonable matching based on the methods used until this point. Matching any one of the three main structures present in the zone caused displacement in the others. The use of more tics to correct for this produced for the first time a map with polygons so skewed as to be unintelligible. Therefore, for the first, and only, time in this project, the zone was further divided into three "sub-zones." Each zone was then matched to the modern structural equivalents, then the three sub-zones were recombined to form the transformed Zone 6.

Zone 7 relied again on the previously transformed map, in this instance the 1874 map. The row of shops was positioned foremost, hoping the rest would fall into place. They did, though not as much as might have been hoped for. Introduction of more tics hopelessly skewed the map however, and it was necessary to settle for the relatively good alignment of the shops (Figure 5.10).

Zone 8 again relied upon the position of the Sutler's Residence depression, using tics selected from the southeast corners. Comparison with the 1874 map demonstrates decent alignment of the old hospital between the two historic maps, indicating that in this area, at least, they are fairly consistent with one another. Zone 1 continued to show consistency in spacing, despite structural changes, and transformed easily by placing tics on all three officers quarters.

Following the transformation of all



Figure 5.8: 1870 map. Right: 1995 map overlain by 1870 map.

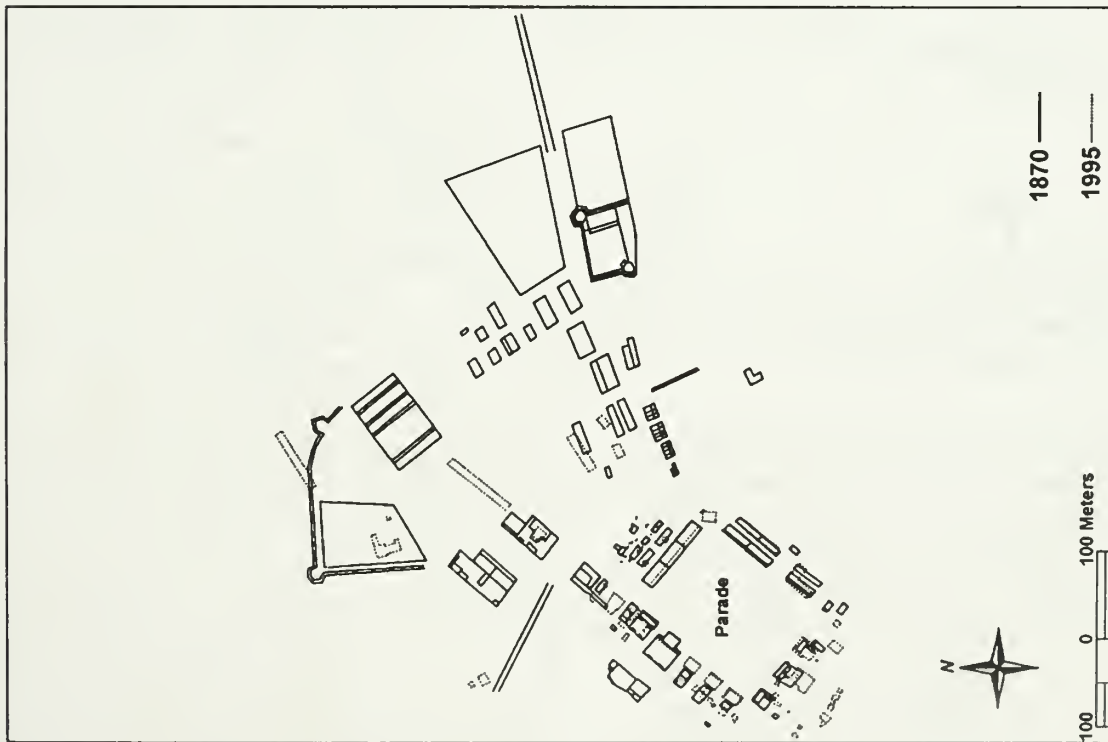
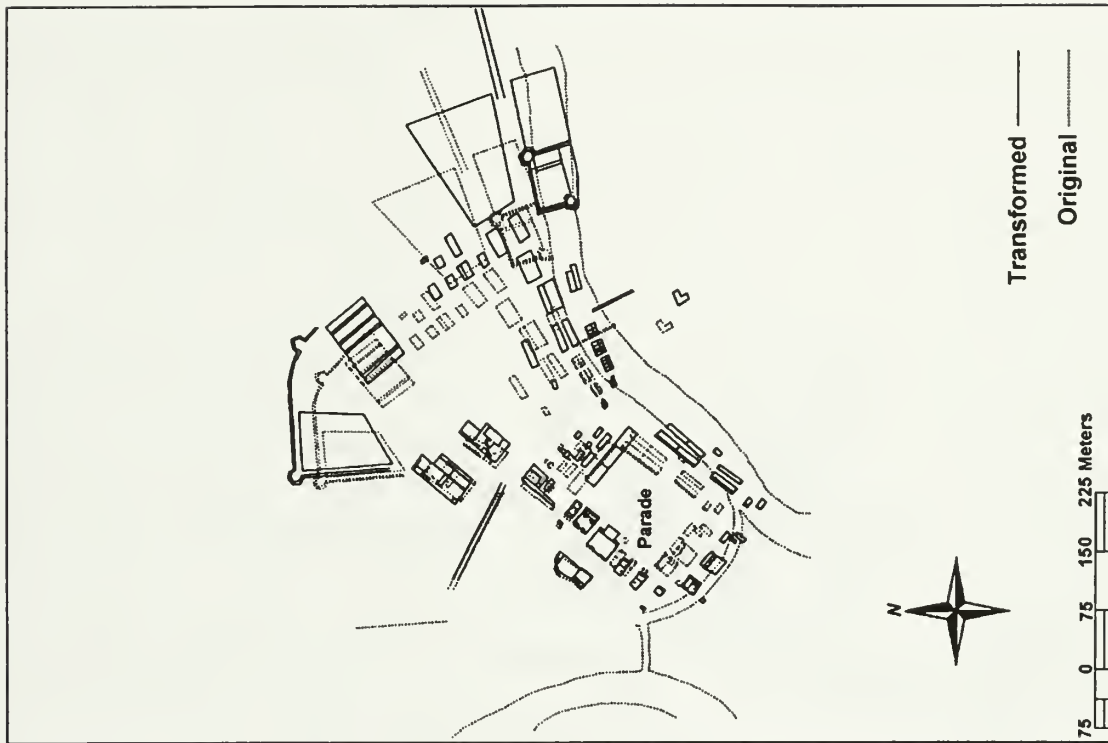


Figure 5.9: Left: Transformed 1870 map overlain on 1995 base map. Right: Transformed 1870 map overlain on original 1870 map.

TRANSFORMATION OF 1867 MAP (Figures 5.11, 5.12)

Because of the year by year reduction of structural features with modern representation, and the remarkable similarity between the 1870 (Figure 5.8) and 1867 maps (Figure 5.11), this series of transformations relied heavily upon tics picked from the corrected 1870 map. Zone 2 revealed decent transformation based on tics placed at the front corners of Old Bedlam. Additional comparison of Zone 2 with the same in 1870 demonstrated good match with the stable structure behind Old Bedlam. Zone 3 used three tics placed on secondary barracks structures behind the central barracks in the 1870 map. At this time in the map sequence, the central barracks no longer exists. Transformations of Zone 3 rely entirely upon the secondary structures depicted in previously transformed historic maps. Zone 4 was transformed based on two tics at the front corners of the foremost barracks.

Zone 5 transformed based on three tics placed on corners of the same twin barracks depicted in the 1870 map. Some ambiguity exists concerning the position of the Band Quarters to the southeast. Although the Band Quarters are most likely the same structure depicted on the 1867 and 1870 map, the 1867 Band Quarters is displaced. A large combination of tics was used to attempt reconciling the Band Quarters while maintaining the integrity of other structures in the zone, but could not be achieved without introducing great skewness into the transformed zone. Zone 6 of the 1867 map transformed with the

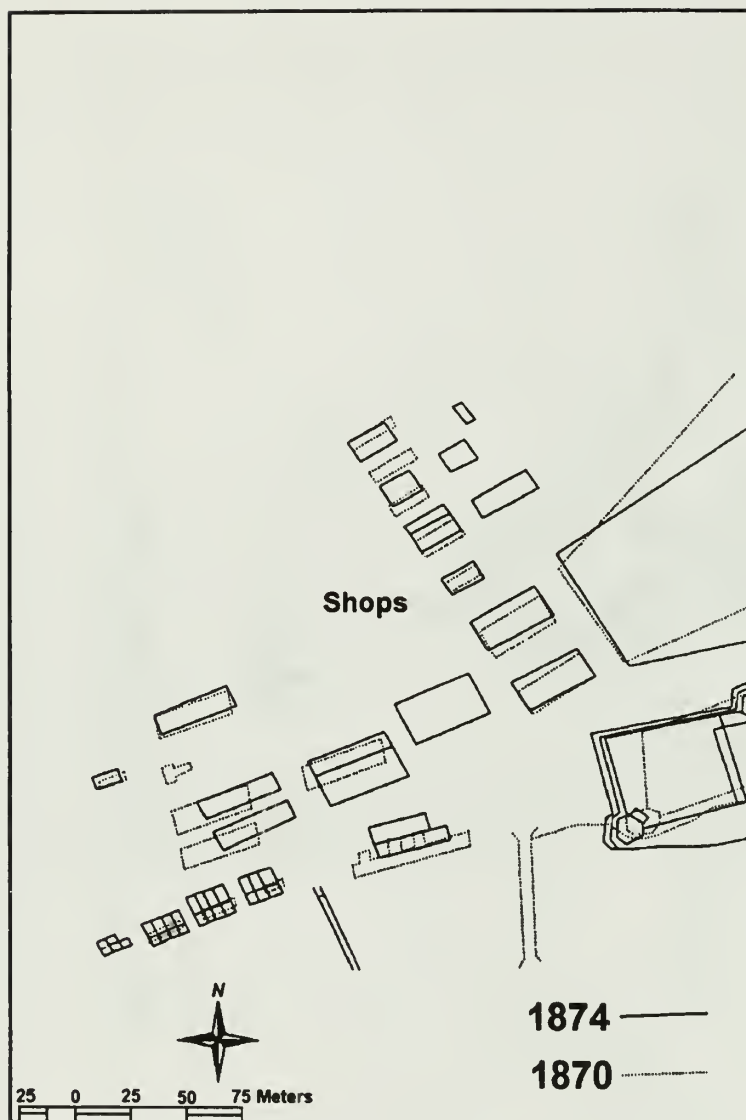


Figure 5.10: Sections of transformed 1874 and 1870 maps showing Quartermaster shops area.

zones, they were joined using MAPJOIN and edited to remove overlapping arcs and natural features (Figure 5.9). An overlay of the original 1870 map with the transformed 1870 map demonstrates planimetric error within the original (Figure 5.9). Distortions of 40-50 m occur in most of the parade ground structures. The series of quartermaster shops northeast of the main fort show planimetric error as high as 80 m.

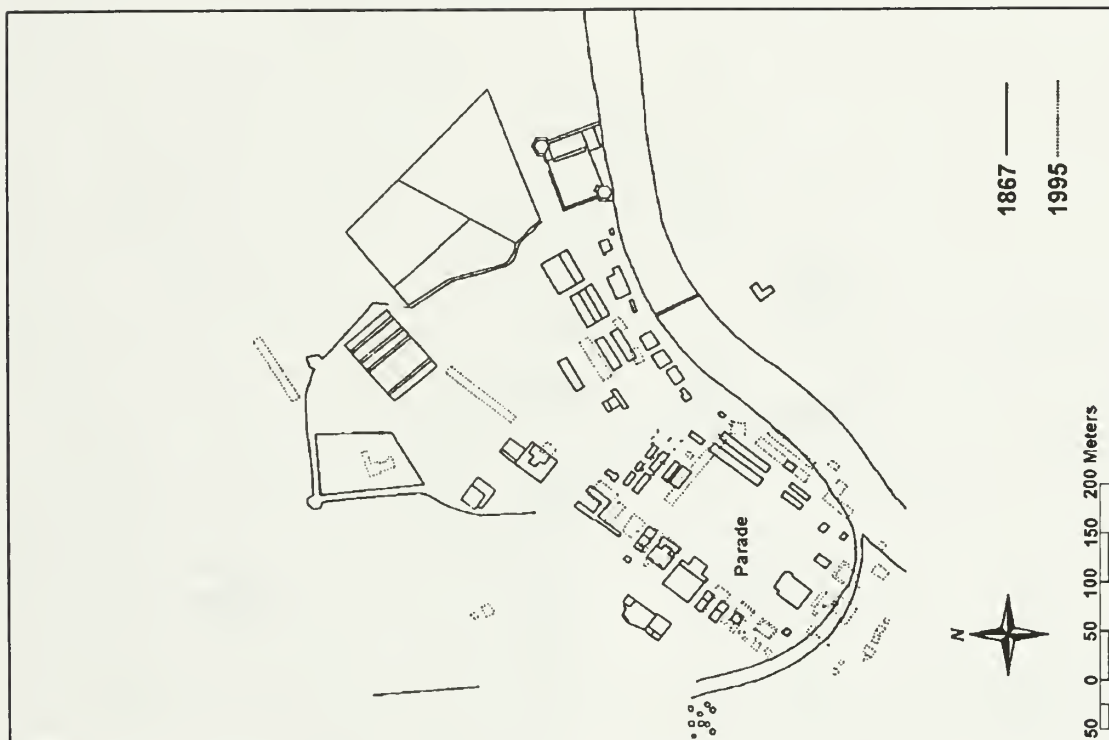


Figure 5.11: Left: 1867 map. Right: 1995 map overlain by 1867 map.



Figure 5.12: Left: Transformed 1867 map overlain on 1995 base map. Right: Transformed 1867 map overlain on original 1867 map.

placement of two tics on the front corners of the central officers quarters in the 1870 and 1867 maps. Zone 7 transformed by placing three tics, two on the front corners of the front barracks, and one tic on the commissary storehouse office of the 1870 and 1867 maps. Zone 8 of the 1867 map used three tics selected from corners of the Sutler's Residence Yard, as presented in the 1870 map, for transformation. Zone 1 transformed based on two tics placed on front corners of the first and second officers quarters in the 1870 map.

Following transformation of all eight zones of the 1867 map, they were joined using MAPJOIN and edited for extra arcs and natural features in ARCEDIT (Figure 5.12). The planimetric error in the original 1867 map is demonstrated by overlaying it on the transformed map (Figure 5.12). The error shown is markedly similar to that present in the original 1870 map (Figure 5.9). Structures surrounding the parade ground appear distorted between 40-70 m. Quartermaster and Commissary storehouses northeast of the main fort are displaced as much as 90 m.

TRANSFORMATION OF 1863 MAP (Figures 5.13, 5.14)

The 1863 map (Figure 5.13) presented the highest planimetric distortion of the entire series. Originally this was suspected to present a more accurate depiction because of its large size (implying scale produced error would be lessened) and the apparently high degree of craftsmanship in the original. This proved not to be the case.

Zone 2 of 1863 transformed on the basis of tics selected at one corner of the officers' quarters east of Old Bedlam and two tics placed on the company shops (Sutler's Store previously). Note the high degree of distortion demonstrated in Old Bedlam (Figure

5.14). Zone 3 transformed based on three tics selected from the secondary barrack structures in the 1867 map. This area appears virtually identical with Zone 3 of the 1867 map. Transformation of Zone 4 occurred through the selection of three tics on the Old Guardhouse as depicted in the 1867 map. At this point in the map sequence, the twin barracks no longer exist. Zone 5 transformed with selection of three tics on the front corners of the two barracks as depicted in 1867. Zone 6 transformed on the basis of two tics selected at the front of the central (and now only) officers quarters in this zone. Zone 7 was transformed based on three tics selected from the commissary office and quartermasters office common to both the 1867 and 1863 maps. Zone 8 of 1863 was transformed with the use of four tics selected from corners of the Sutler's Residence as portrayed in both the 1867 and 1863 maps. Zone 1 transformed with the selection of three tics on front corners of the first two officers quarters in both the 1867 and 1863 maps.

Following transformation of all zones they were joined using MAPJOIN and edited for extra arcs and natural features in ARCEDIT (Figure 5.14). The planimetric error in the original 1863 map is demonstrated by overlaying it with the transformed map (Figure 5.14). Distortions of between 25-50 m occur surrounding the parade ground, and are high as 80 m in the commissary and quartermaster shops northeast of the main fort. The Sutler's Residence, the hospital and stables north of the fort also demonstrate large rescaling problems in the transformed map. Correct positioning of the Sutler's Residence unfortunately resulted in this rescaling.

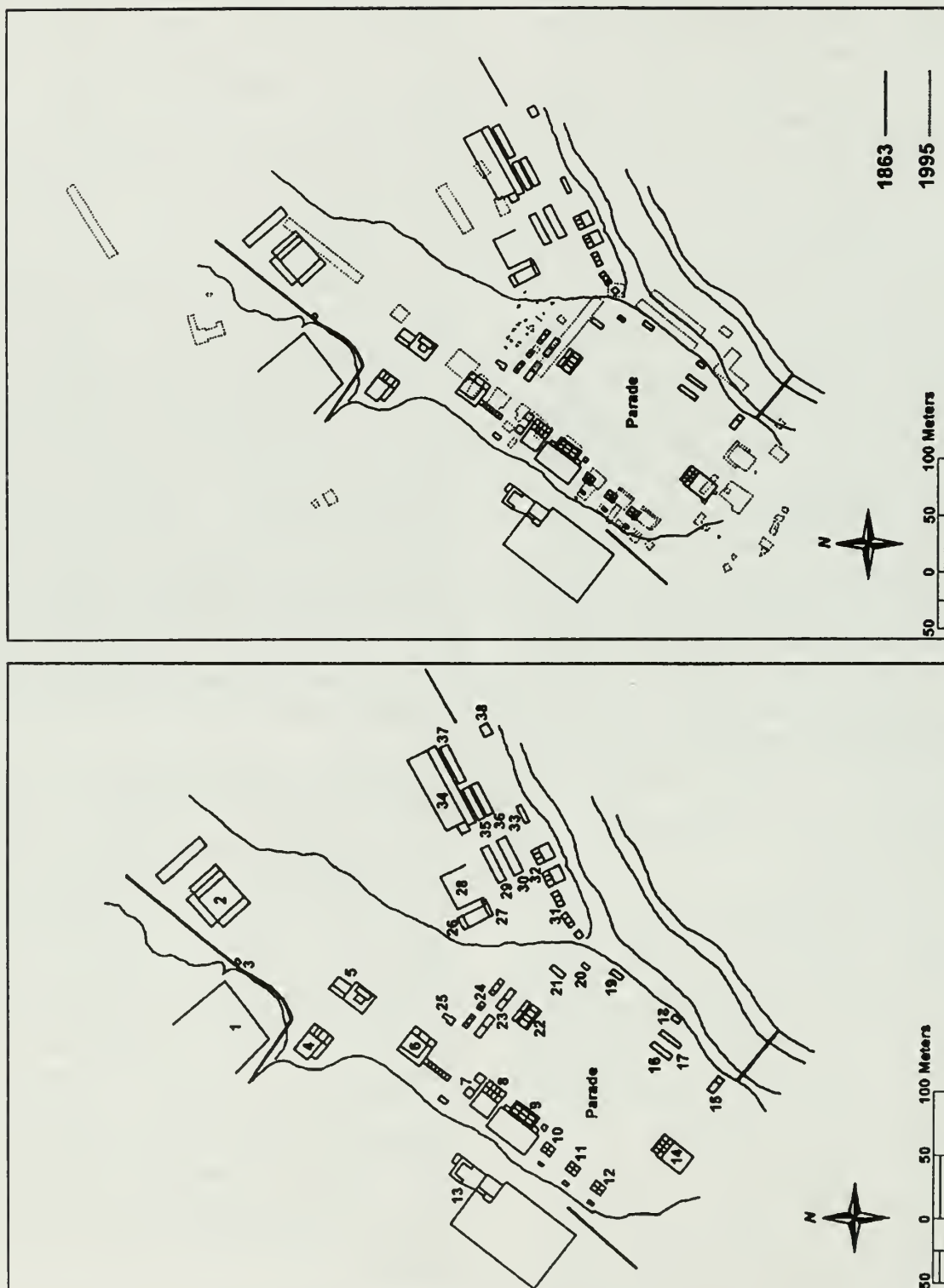


Figure 5.13: 1863 map. Right: 1995 base map overlain by 1863 map.



Figure 5.14: Left: Transformed 1863 map overlain on 1995 base map. Right: Transformed 1863 map overlain on original 1863 map.

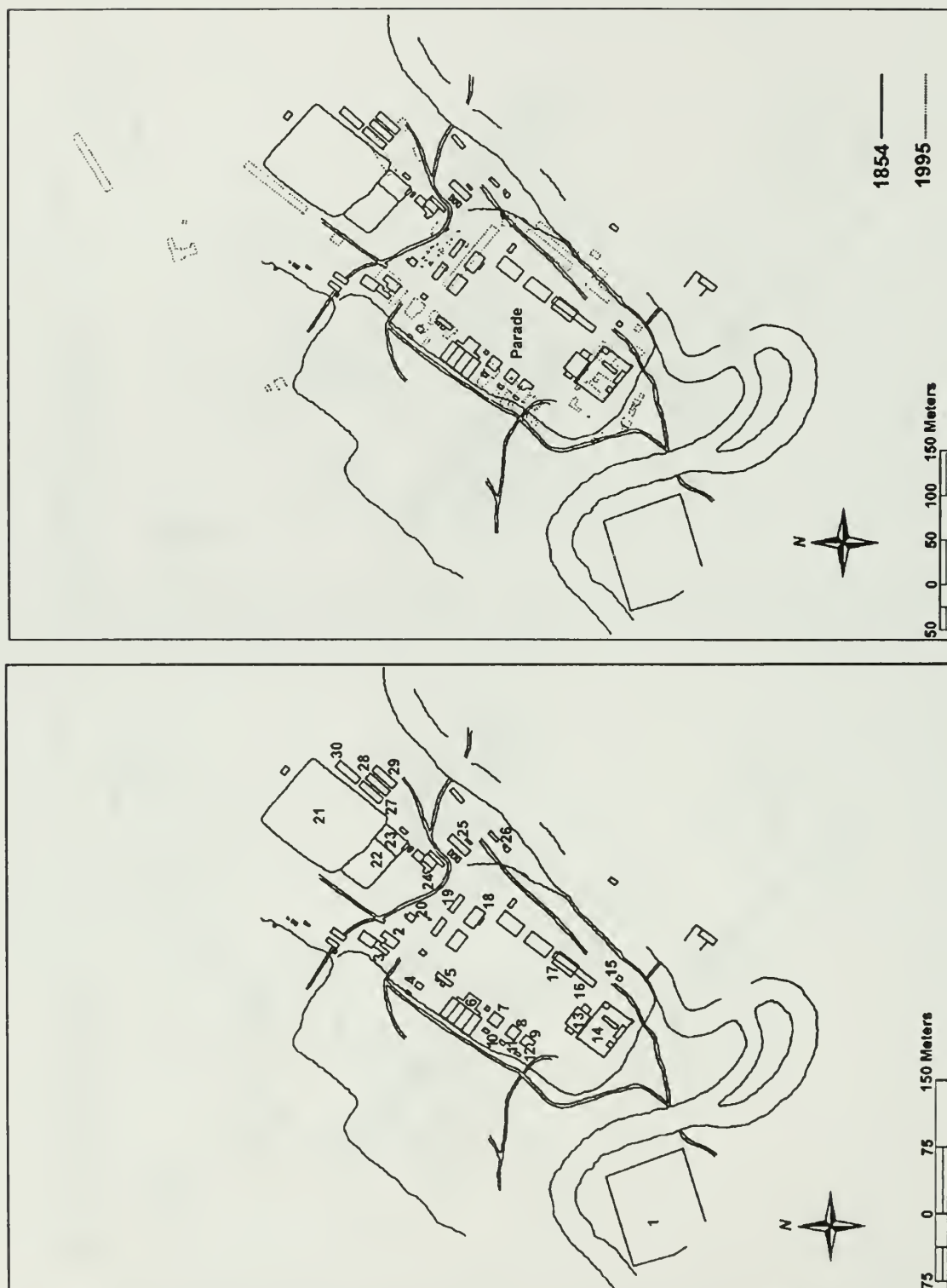


Figure 5.15: Left: 1854 map. Right: 1995 base map overlain by 1854 map.

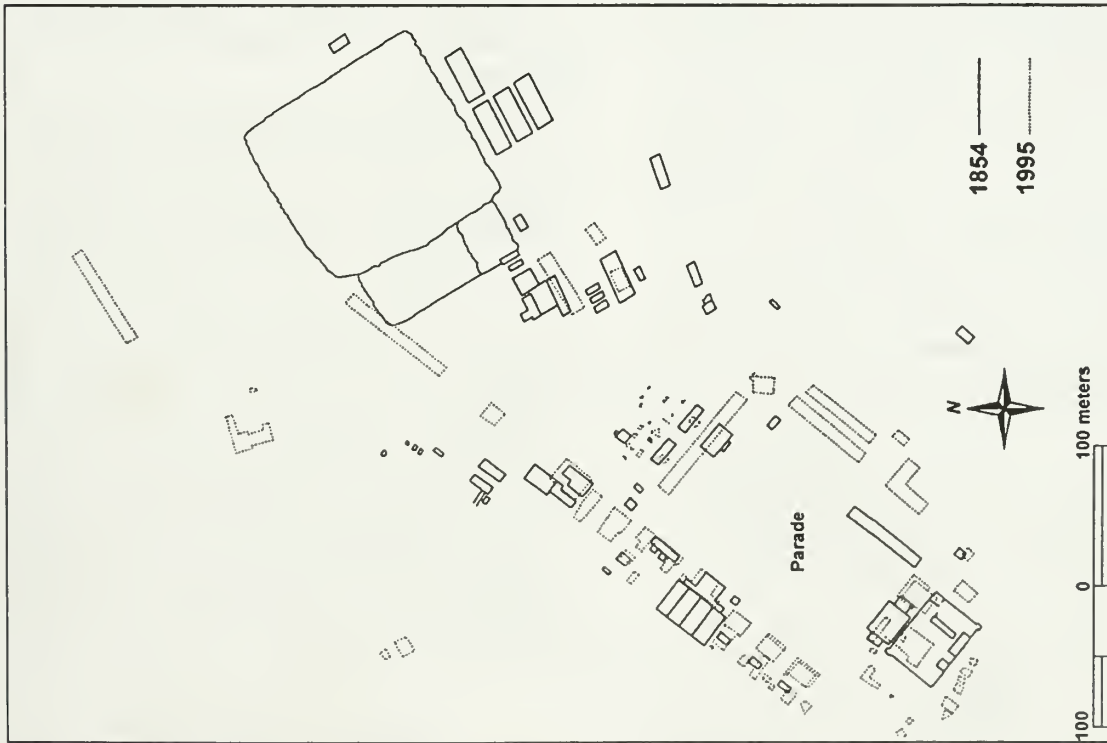
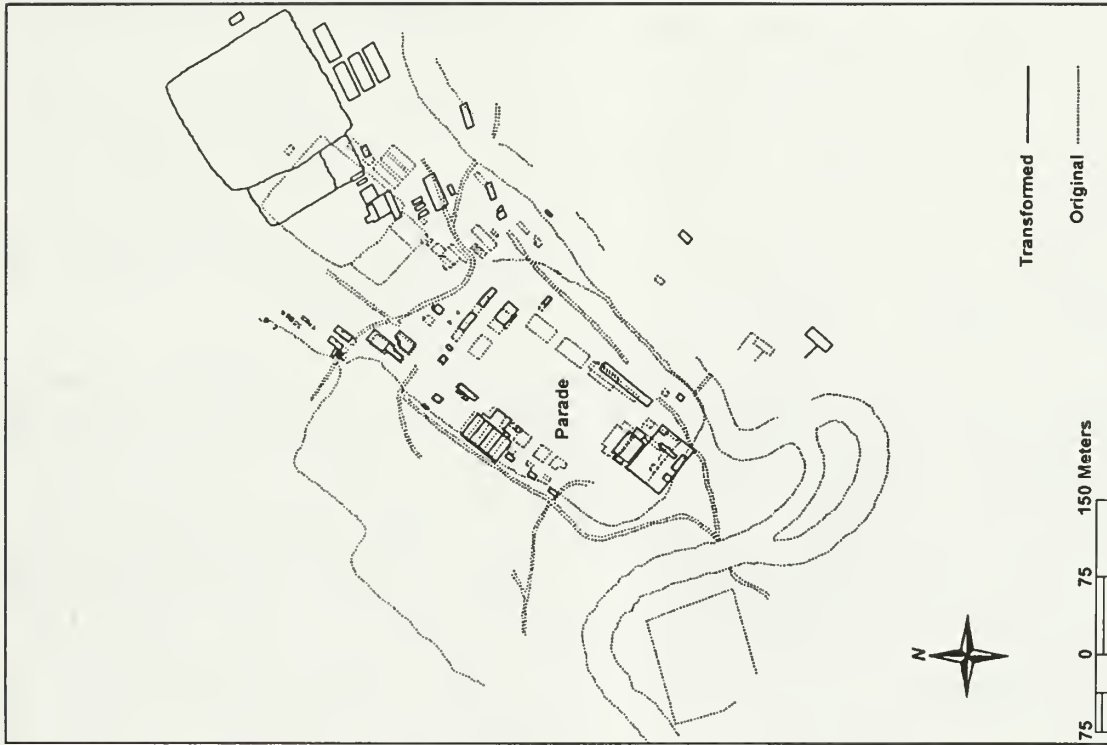


Figure 5.16: Left: Transformed 1854 map overlain on 1995 base map. Right: Transformed 1854 map overlain on original 1854 map.

TRANSFORMATION OF 1854 MAP

(Figures 5.15, 5.16)

The transformation of the 1854 map (Figure 5.15) relied for the first time upon cutting several transformed zones from transformations associated with entirely different zones. This procedure was required because of the lack of structural continuity between the 1854 map and later historic maps, thereby eliminating corrections based on comparisons between maps.

Zone 2 of 1854 transformed with three tics, one from a front corner of Old Bedlam and two from the officers quarters immediately to the northeast. This transformation was also used for Zone 8. Zone 3 transformed on the basis of two tics selected from the secondary barrack structures as depicted in the 1867 map. Zone 1 transformed based on two tics selected from the first two officers quarters as depicted in the 1863 map. Zone 5 transformed based on two tics selected from the band room structure as depicted in the 1870 map. Additionally, this transformation was used for Zones 4 and 6. Zone 7 of 1863 transformed based on the selection of three tics from the two laundress quarters depicted in the 1867 and 1854 maps.

Following the transformation of all zones, they were combined using MAPJOIN and edited for erroneous arcs and natural features using ARCEDIT (Figure 5.16). The planimetric error present in the original 1854 map is demonstrated by overlaying it with the transformed map (Figure 5.16). Structures surrounding the parade ground show decent original accuracy and are displaced under 25 m. Larger planimetric error occurs in the storehouse and yard area northeast of the parade ground, where transformed structures are removed as much as 100 m from their original positioning. These structures have also undergone an enlargement due to

rescaling in the transformation.

TRANSFORMATION OF 1851 MAP

(Figures 5.17, 5.18)

Zone 2 of 1851 (Figure 5.17) transformed based on two tics selected at the rear corners of Old Bedlam as depicted in the 1995 base map. Zone 3 of 1851 was transformed based on two tics placed at the rear of the remaining barracks structure, as depicted in the 1854 map.

Zone 6 of 1851 transformed on the basis of three tics placed on corners of the old trading fort, as presented in the 1854 map. Additionally, Zones 4 and 5 of 1851 were selected from this transformation as well. Zone 7 of 1851 lacks almost any continuity with the 1854 map. An arbitrary transformation was generated based on two tics placed on the quartermasters' office structure. Zone 1 of 1851 transformed based on two tics selected from Old Bedlam in the 1854 map. Zone 8 of 1851 held no map features, and was therefore not included in this transformation sequence.

Following transformation of all zones in the 1851 map, they were joined using MAPJOIN and edited for arc redundancies and natural features in ARCEDIT. Additionally, several features drawn in the original 1851 map were labeled as proposed, but did not appear in the 1854 map. These features were removed (Figure 5.18). Overlaying the original 1851 map with the transformed 1851 map demonstrates the degree of planimetric error in the original (Figure 5.18). Displacements of 10-20 m occur in the structures surrounding the parade ground, and are high as 60-70 m in the storehouse area northwest of the parade ground.

EVALUATING THE TRANSFORMATIONS

The effectiveness of the transformation

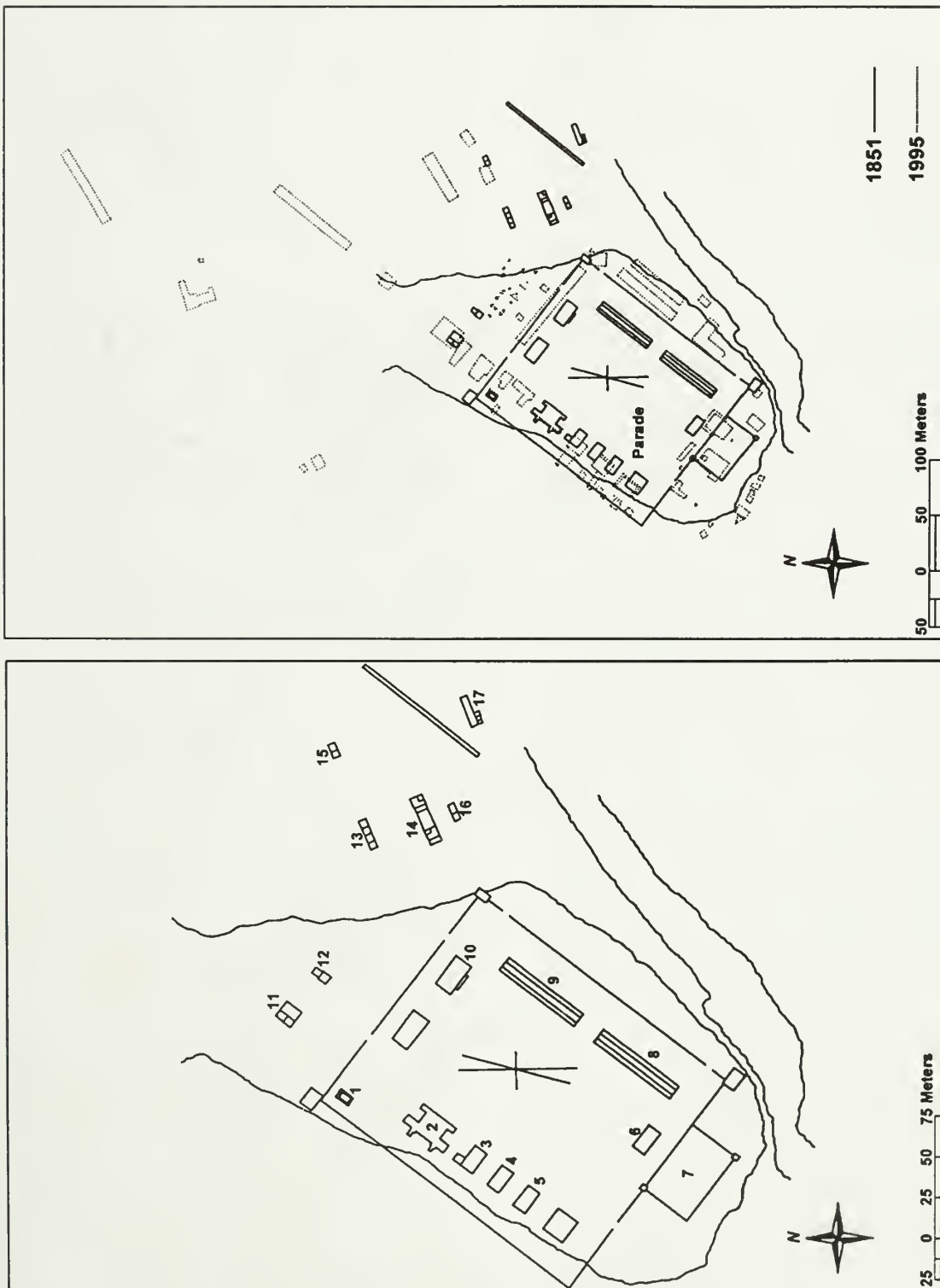


Figure 5.17: Left: 1851 map. Right: 1995 base map overlain by 1851 map.

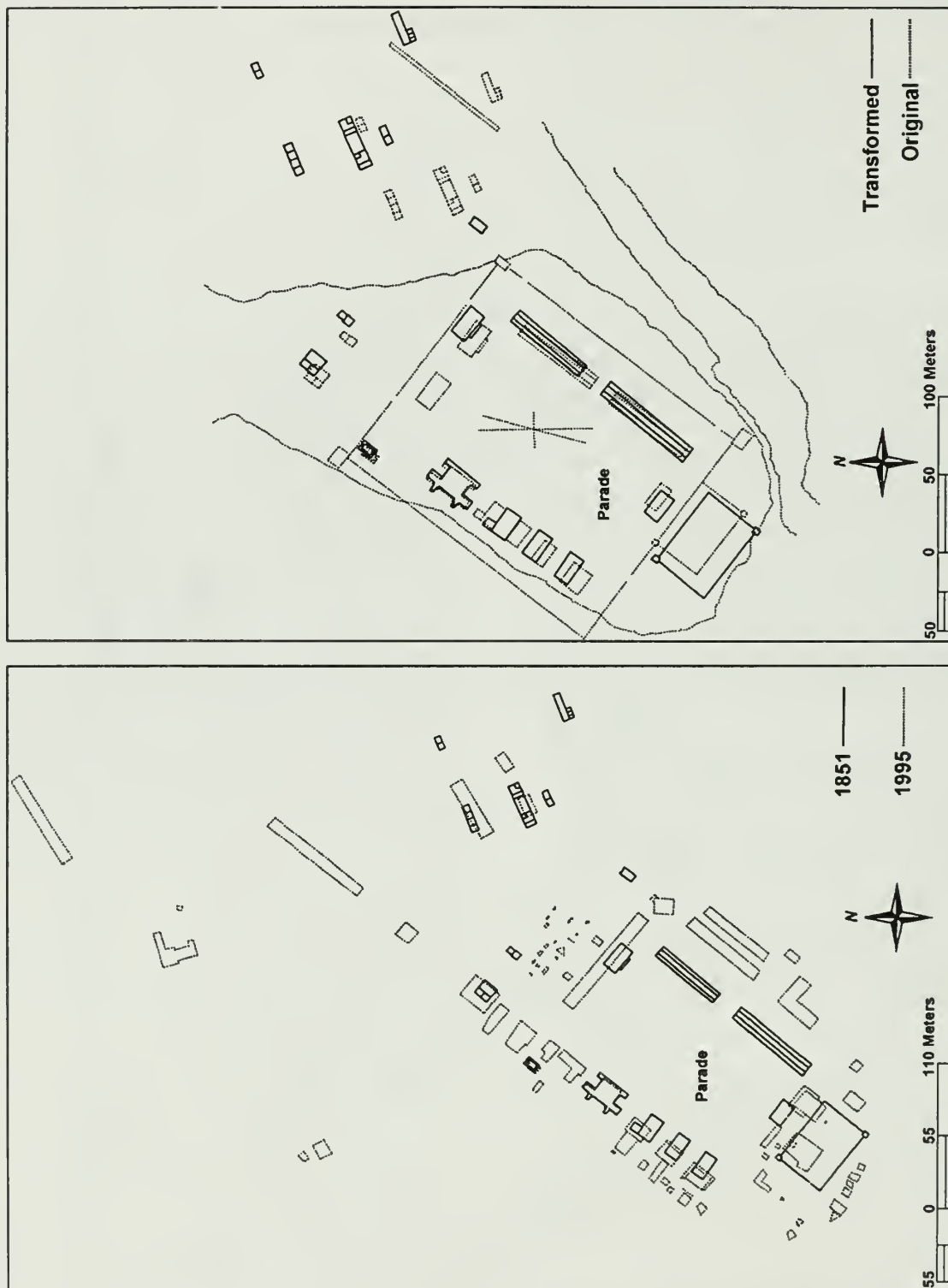


Figure 5.18: Left: Transformed 1851 map overlain on 1995 base map. Right: Transformed 1851 map overlain on original 1851 map.

process may only be predicted until archeologic excavation or remote sensing verify or disprove the veracity of structure placements. Certain evaluations concerning the likely level of accuracy are discernable from available data, however. The structure by structure shifts that occurred in this process demonstrate, through the nature of their transformations, varying degrees of control. This level of control in all instances fits into one of four discrete categories.

Primary control (Figures 5.19-5.22), and thereby the highest level of accuracy, affects those historic structures represented on the modern base map, either restored buildings, standing walls, foundations or mounds and depressions. Placement of these structures in the historic series relies on the spatial location of the same structures in the modern base map. The modern base map is assumed to correctly portray the actual site. Therefore these structures represent the highest planimetric correctness of the entire set.

Secondary control (Figures 5.19-5.22) is represented by structures that have no modern equivalent but whose transformation was linked with neighboring structures that do. This transformation relies on modern structure locations, but in a peripheral manner. Tertiary control (Figures 5.19-5.22) belongs to those structures having no modern equivalent, and no neighbors with modern equivalent. The control for this case of structures relies upon neighboring secondary controlled structures. Structures in this tertiary group can be considered as thrice-removed from the spatial distribution reflected in the modern base map.

Quaternary control (Figures 5.19-5.22) includes those structures having no modern equivalent, no neighbors with modern equivalent, nor neighbors having secondary or tertiary characteristics. Structures in this

group were placed according to a single transformation of Old Bedlam, or transformation of the nearest zone. Therefore these structures represent the planimetric distribution present on the original historic maps. The value of their transformation is highly suspect as offering any improvement. Only a handful of structures within the map series possess this quaternary characteristic, and nearly all emerge from the earliest map years, 1851 and 1854.

The control coded maps portray predicted accuracy of structure transformations, based on the available evidence for those transformations. They show a non-quantitative hierarchy which users of this data may consult in evaluating transformation confidence levels. These maps increase the overall effectiveness of the transformations by conveying relative strengths and weaknesses of the predictions.

Although this project lacks on-site testing of the transformation accuracy, an internal proof of accuracy exists. Transformations were achieved initially by the placement of tics on primary structures. However, not all primary structures were selected for this tic placement. Primary structures transformed accurately without the benefit of tics essentially prove the effectiveness of the methodology. Because these structures lacked tics in the transformation, their correct positioning relied instead upon the accurate transformation of neighboring structures, precisely the same mechanism used for the transformation of secondary and tertiary structures. This implies that the same level of accuracy observed in the transformation of primary structures without tics can be expected in secondary and tertiary structures transformations.

Proving the veracity of these predictions at the actual site, or "ground truthing,"

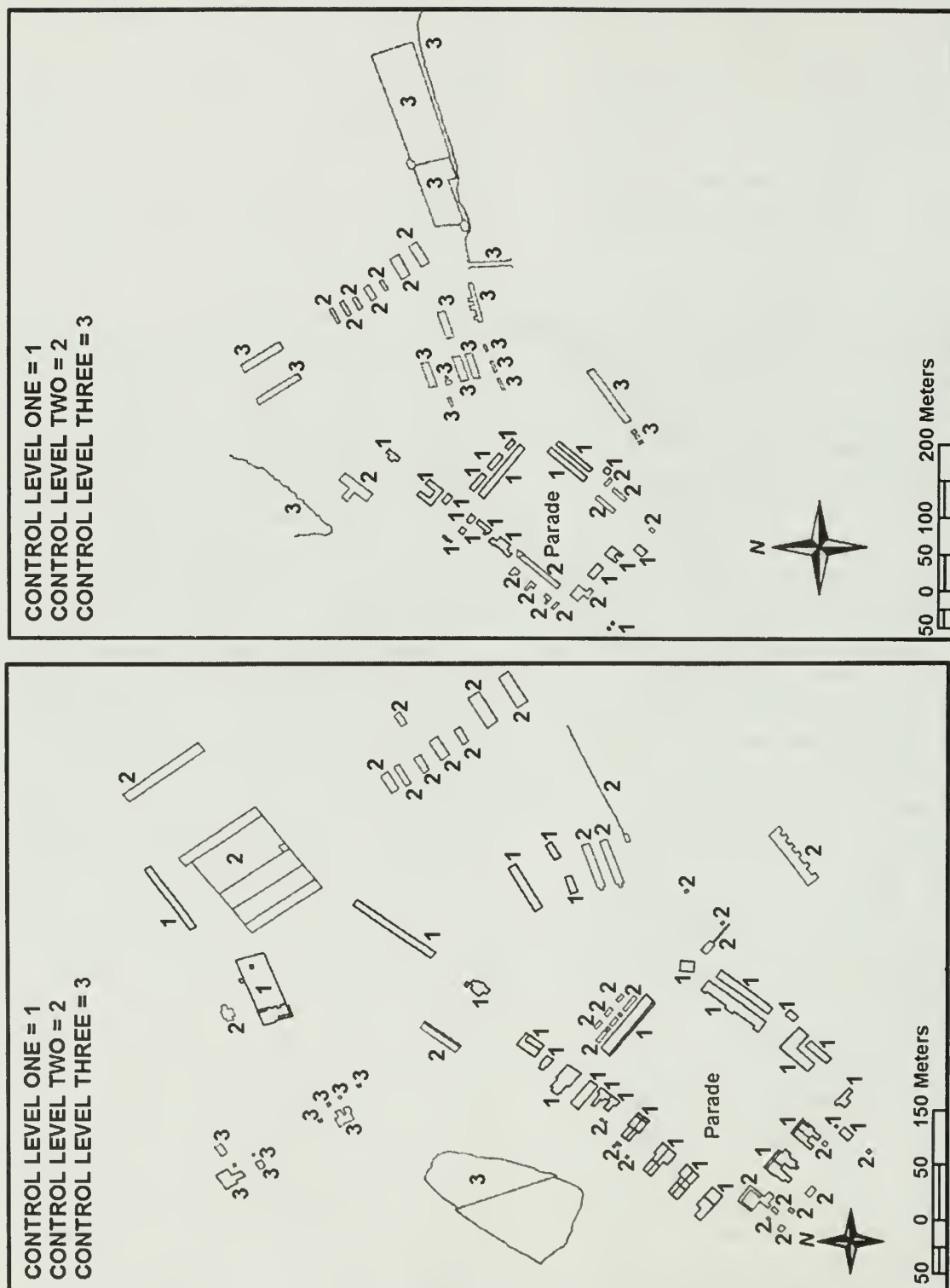


Figure 5.19: Transformed maps showing control levels. Left: 1888. Right: 1874.

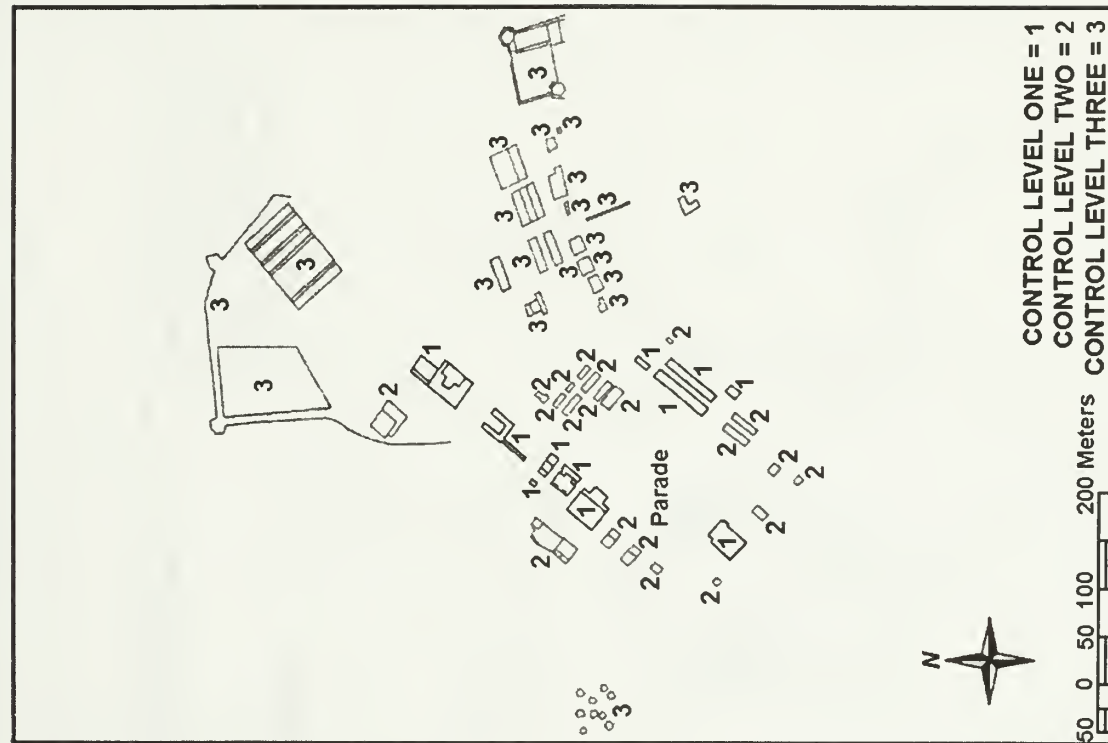


Figure 5.20: Transformed maps showing control levels. Left: 1870. Right: 1867.

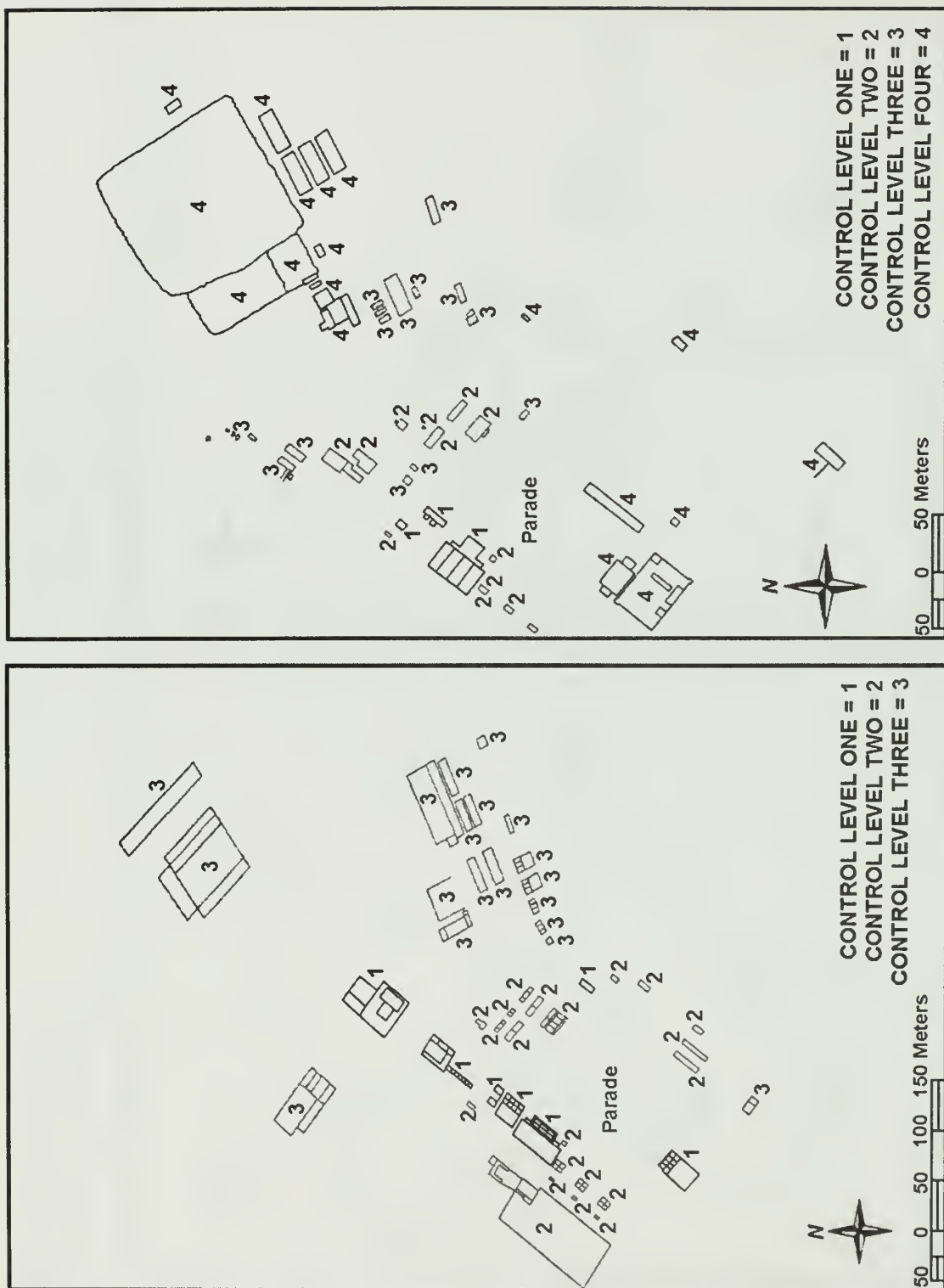


Figure 5.21: Transformed maps showing control levels. Left: 1863. Right: 1854.

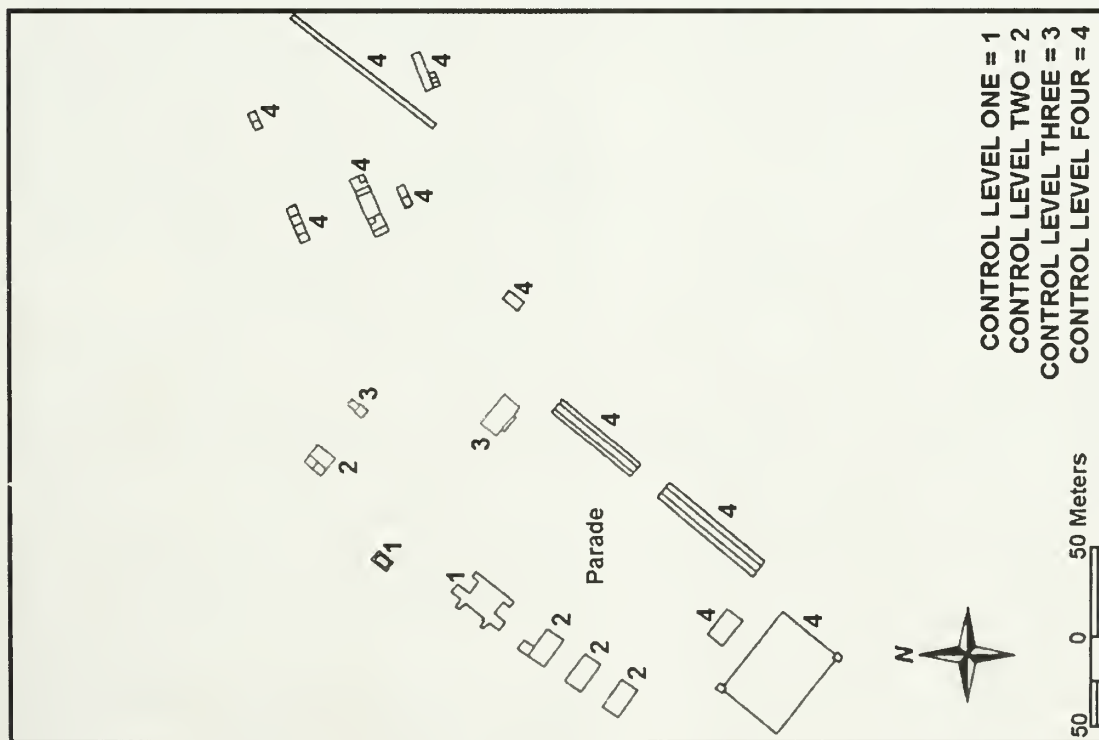


Figure 5.22: Left: Transformed 1851 map showing control levels. Right: Composite map showing 1995 and transformed 1888, 1874, 1870, 1867, 1863, 1854, and 1851 maps.

cannot be achieved without a program of remote sensing and archeological excavation at Fort Laramie. A program of this nature, using the maps provided within this project should begin by attempting to locate secondary control coded structures. These transformations ideally bear the highest accuracy of all structures lacking modern surficial representation. Systematic surveys using surface level remote sensing instruments (such as resistivity instruments and proton magnetometers), should concentrate on the areas containing secondary control structures. Locations of these structures can be approximated by calculation of transformed UTM's (Figures 5.23-5.26; Appendix A.1), with the remote sensing based on these UTM's and not the original historic maps.

DISCUSSION

An attempt toward defining GIS is necessary in the context of this study if for no other reason than to create a partial justification for the development of the Fort Laramie database. GIS emerges from advances in several areas of technologic innovation. It reflects the influx of computerized data management within the academic discipline of geography. It also may be construed as emerging from the new tradition of virtual space generation and management, represented by multi-media, hypertext and virtual-reality. These sub-disciplines in computer science manifest themselves in the cross referencing of large and often previously unlinked pools of data. The arrival of high powered, reasonably priced personal computers allows the development and use of these technologies on a broader scale than previously imagined, taking GIS from the province of military, government, and funded academia, and offering it to the managers and users of more obscure databases, such as

Fort Laramie.

. . . This notion, it seems to me, captures more effectively the spatiality of GIS - a virtual space of data manipulation and representation whose nominal tie to the earth (through GPS and other measuring devices) is infinitely manipulative and malleable . . . Digital spatial data and GIS permit the infinite manipulation of data layers, the construction of an infinite sequencing of new views on the data landscape, new angles of view, multiple overlays, and correlations of spatial data landscapes. Space and data have become fully manipulatable in this spatial environment . . . (Pickles 1995:7).

The application of GIS operations toward historic, archeological, and cultural resources represent the fusion of several scientific and managerial subdisciplines. GIS takes aspects from the fields of computer science, geography, and remote sensing and gives back a new and unique manner in which spatial information can be stored, described, presented and manipulated. Spatial database development, in particular, promises large benefits for land managing agencies, particularly public lands that are subjected to multiple and often conflicting uses.

In the example of Fort Laramie, the resources are said to be cultural, historic, and archeologic. Yet many segments of these resources are invisible to the modern eye. The spatial database of Fort Laramie offers site managers the ability to reference spatially *through time*. Fort Laramie exists, set aside and preserved, because of temporal context. When we say it is "historic space," what we mean is that lives, events, and artifacts of humanity cause this space to draw significance from the past. Only a small fraction of the structures erected over the forty-one year life of the fort survive; the

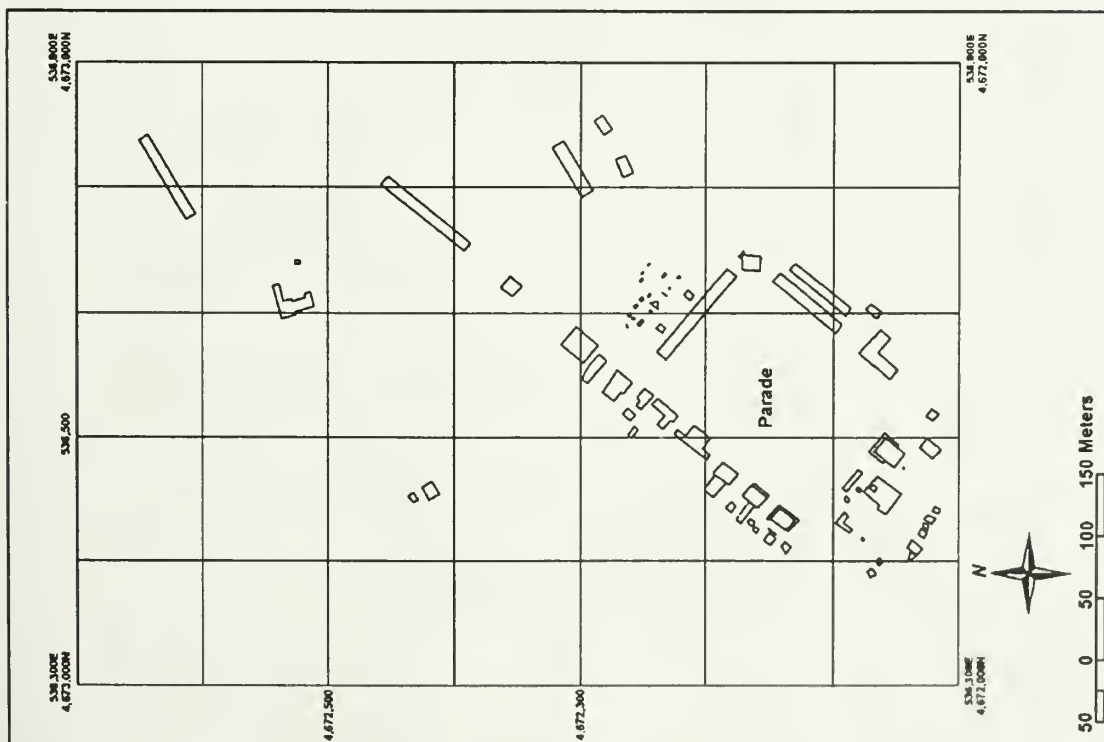
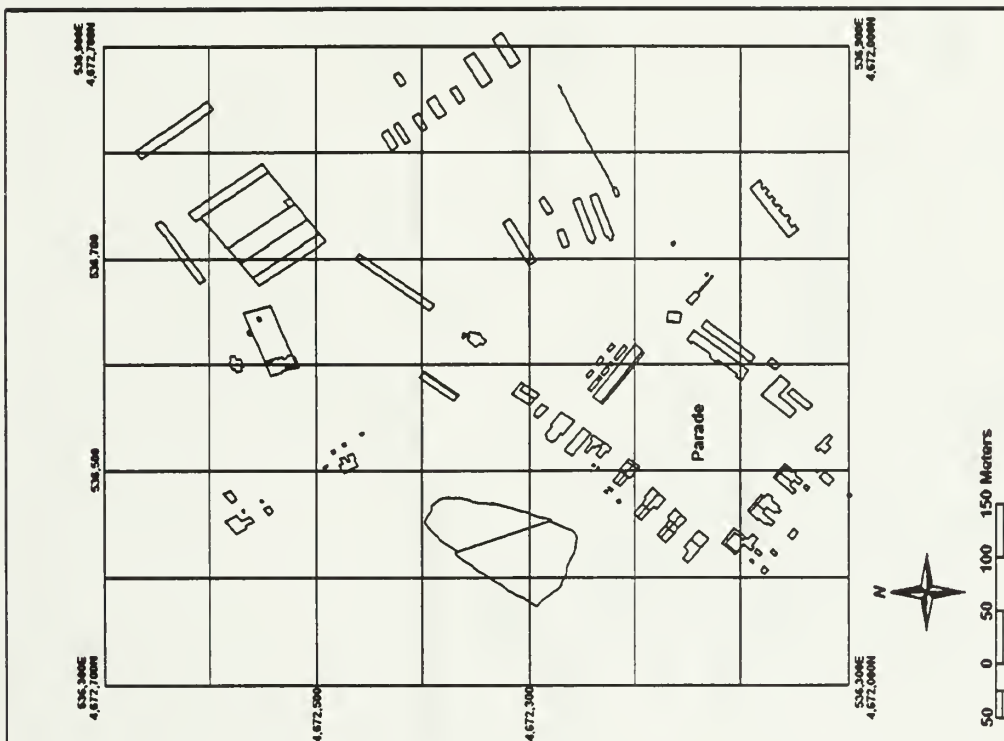


Figure 5.23: Maps with 100 m grid and UTM reference locations. Left: 1995 base map. Right: Transformed 1888 map.

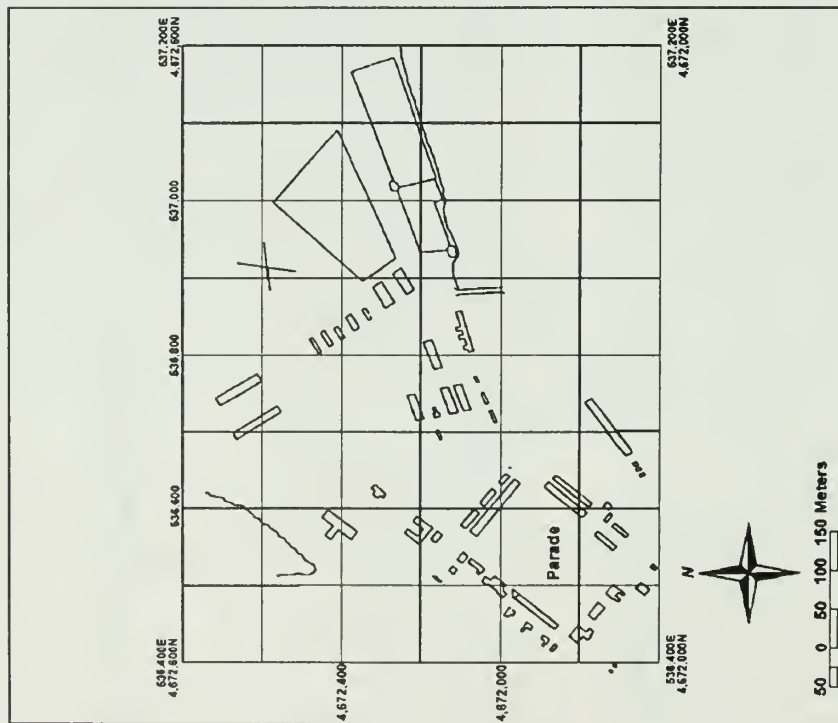
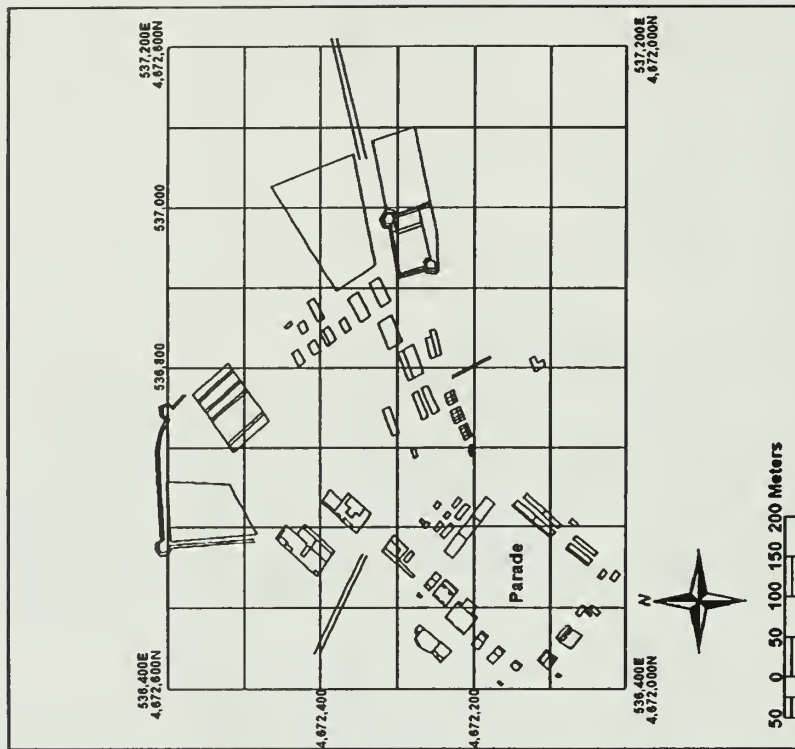


Figure 5.24: Maps with 100 m grid and UTM reference locations. Left: Transformed 1874 map. Right: Transformed 1870 map.

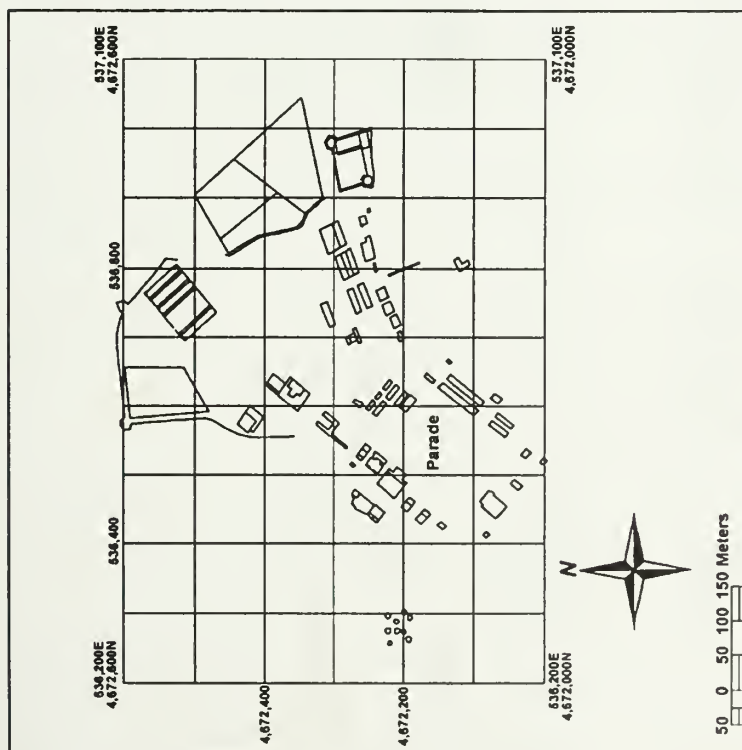
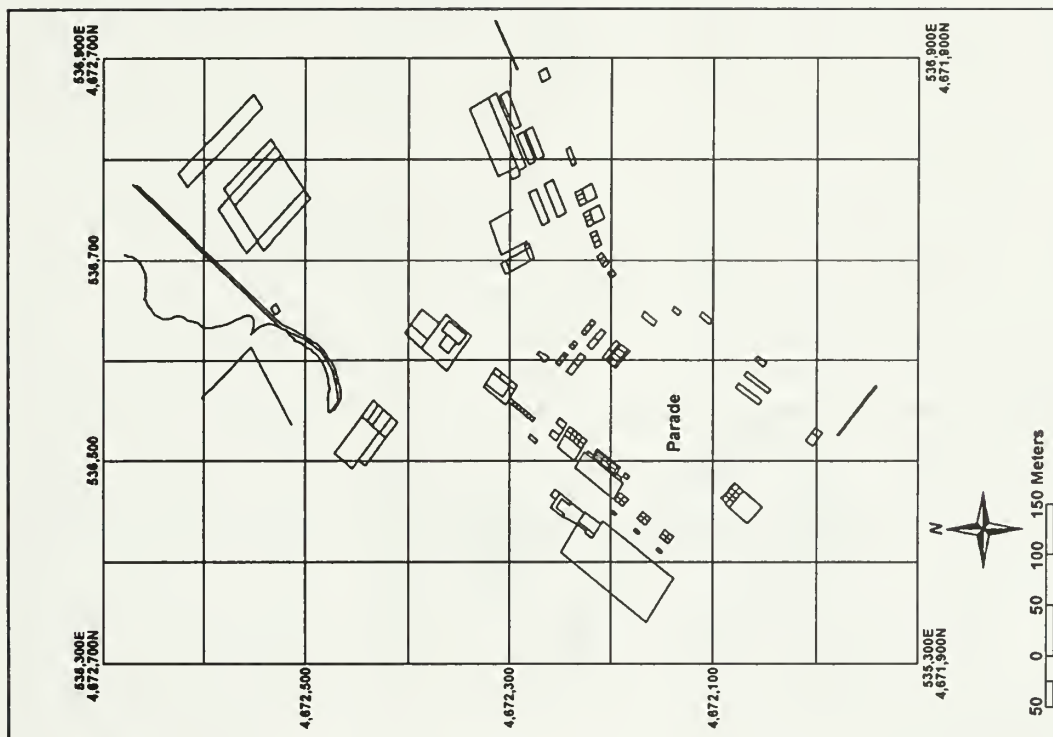


Figure 5.25: Maps with 100 m grid and UTM reference locations. Left: Transformed 1867 map. Right: Transformed 1863 map.

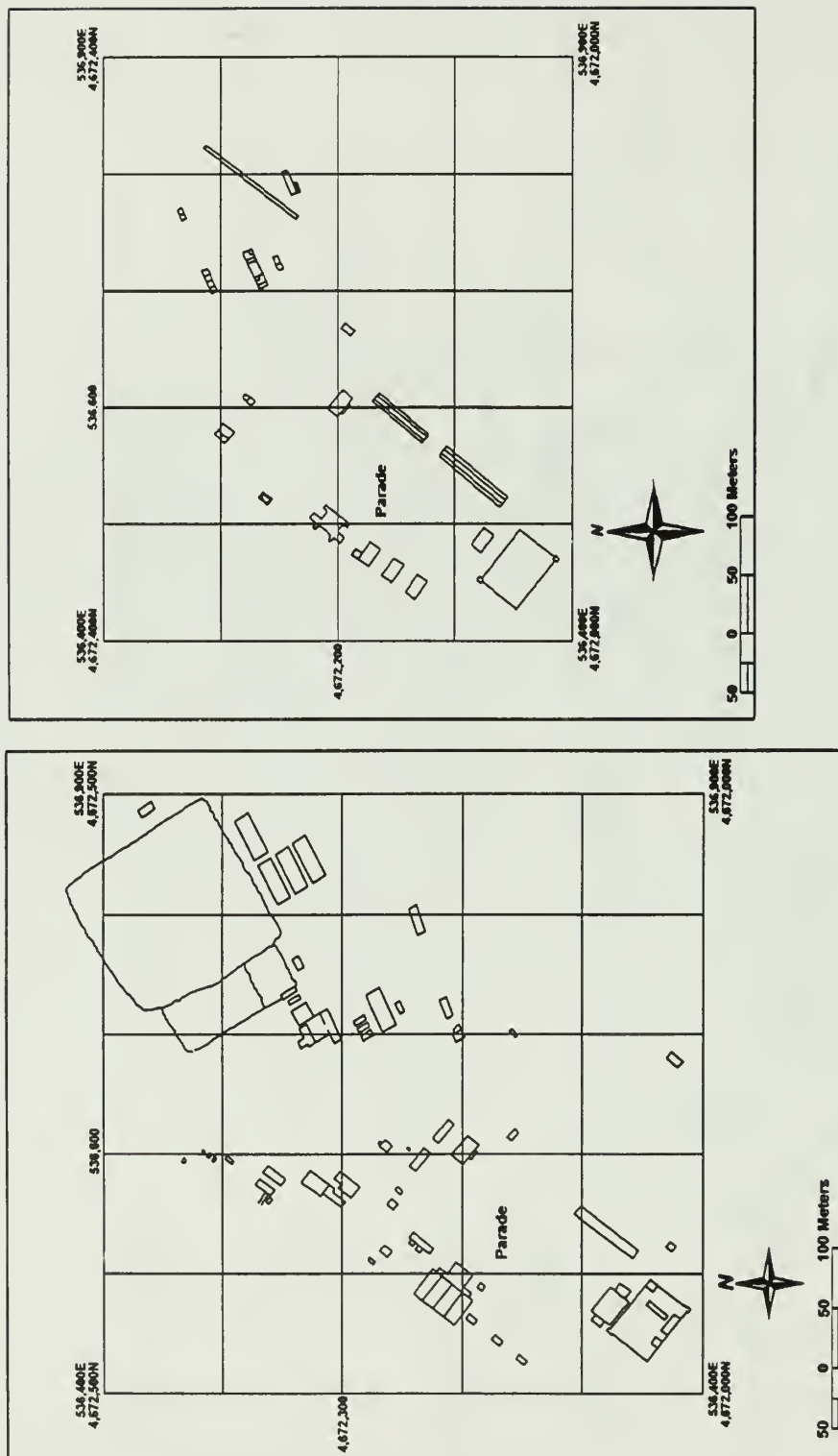


Figure 5.26: Maps with 100 m grid and UTM reference locations. Left: Transformed 1854 map. Right: Transformed 1851 map.

rest are buried, ruined, eroded or gone. The significance given to the space at Fort Laramie, and places like it, emanates from human recognition of the past. How does one manage artifacts of the mind?

GIS and spatial database management (some writers would claim they are the same) in essence create an artificial space, like any map. A torrent of information is stored in a place and manner that is so like the manner in which we perceive the larger world that we recognize it instantly, and can quickly assimilate information from it. GIS creates an array of maps, linked with one another, and the information on any one map may be brought into the others. In this manner, users of the system essentially are given the ability to construct their own space, which models aspects of the larger. The process at its best is interactive.

The planimetric error present in the original historic maps is demonstrated in the map series overlaying the transformed and original historic maps, and the series overlaying the 1995 base map and original historic maps (Figures 5.6-5.18). GIS brings the inaccuracy present in the historic maps into sharp relief by portraying them within the referent space of the transformed and modern base maps. The "error space" inherent in the original historic maps further complicates the already difficult task of managing cultural resources lacking surficial representation. When attempting modern location of absent structure sites, Fort Laramie scientists and planners have been forced to rely on inaccurate maps with archaic measurement units. Discrepancies of over 100 m are encountered when the modern base map and transformed historic maps are overlain with the originals. These illustrate the difficulties inherent in using the original historic maps. The transformed maps at-

tempt to correct the "error space," and to permit more accurate and successful location efforts (Figure 5.22, right).

Several conclusions may be drawn from this project. As the rejection of the initial hypothesis implies, planimetric correction of inaccurate historic maps cannot be achieved through one to one transformations between modern and historic maps. The complexity of the planimetric error, which demonstrated variation in clusters of buildings presented on a single historic map, necessitated the division of the historic maps so that the transformative process could be carried out on a finer scale.

The flexibility of PC ARC-INFO allowed a revised methodology, permitting the completion of the project. ARC-INFO has proved itself in all facets of this study, being capable not only of handling the transformations demanded of it, but also in directory and data management. Historic map coverages were easily segmented, edited and eventually rejoined. This was so despite the great complexity of a database containing well over a hundred individual coverages.

GIS itself is proven capable of assimilating and improving upon cartographic information of a historical nature. GIS permits substantive advances in the way we approach historic site management and archeology.

CHAPTER 6

FORT LARAMIE GEOARCHEOLOGIC OBSERVATIONS, 1994

by
Michael McFaul, Karen Lynn Traugh, and Grant D. Smith

INTRODUCTION

Geomorphic and geologic investigations were an integral part of the 1994 archeological investigations at the Fort Laramie Quartermaster Dump. These studies were to provide information on the alluvial processes in the area over the past 150 years and attempt to predict where the historic dump might be preserved. Geoarcheologists also assisted in "ground-truthing" remote sensing anomalies (see Somers, Chapter 4). Besides these tasks, an unsuccessful attempt was made to locate an "adobe"-walled horse corral associated with the U.S. Army occupation of Fort Laramie (see Chapter 1). Approximately 127 meters of soil-sediment/cultural relationships were examined in (Table 6.1) backhoe trenches in the vicinity

of the "Adobe Corral." None of the exposures exhibited sediment resulting from corral use by the military occupation (A.D. 1849-1890). Sediments having the color and composition of the adobe clay supposedly used to build the corral were also absent.

PROCEDURES

An initial reconnaissance of the alluvial terrains was made to delineate land forms having the potential to yield corral remnants. Delineations were made based upon an understanding of regional alluvial chronologies (Anderson 1973; Leopold and Miller 1954; McFaul et al. 1994; Rehis et al. 1991), the alluvial landscape (Schumm 1977), and various historic records (photographs, maps, remote sensing, written accounts). A sub-surface sampling program of the soils and

Table 6.1: Proveniences of backhoe trenches excavated at the Fort Laramie Quartermaster Dump Project.

| NUMBER | NORTHING | EASTING | LENGTH |
|--------|------------|-------------|------------|
| BHT 1 | N878-N1010 | E871 | 33 meters |
| BHT 2 | N1020 | E850-E880 | 30 meters |
| BHT 3 | N1017 | E869-E854 | 15 meters |
| BHT 4 | N1031 | E840-E848 | 8 meters |
| BHT 5 | N980 | E780-E800 | 20 meters |
| BHT 6 | N970-N961 | E1001 | 9 meters |
| BHT 7 | N976 | E1001-E1012 | 12 meters |
| TOTAL | | | 127 meters |

sediments in the area of the corral was conducted to locate the "adobe" walls of the horse corral. Approximately 106 meters of backhoe trenches were subsequently excavated into the terrain believed to be associated with the corral. Considerable care was given to trench placement. Trenches (1-5) planned to intersect the Adobe Corral were at least fourteen meters in length and placed to bisect suspected wall locations. In the only case where sediments the color and texture of adobe were uncovered (Backhoe Trench 2); two other trenches (Backhoe Trench 3 and 4) were excavated parallel to the original trench to determine the extent of the sediments. Unfortunately, the gray colored, clay-rich sediment proved to be an alluvial unit of limited extent.

Based upon in-field horizontal tracing of the subsurface military cultural unit, all the backhoe trenches were excavated to a depth sufficient to expose prehistoric, undisturbed, geologic strata. Documentation of soil-sediment relationships exposed within the trenches followed standard geologic, pedologic, and geoarcheologic procedures (Birkeland 1984; Birkeland et al. 1991; Krumbein and Sloss 1963; Soil Survey Staff 1962, 1975; Reineck and Singh 1980; Waters 1992).

BACKHOE TRENCHES

Seven backhoe trenches were excavated into the alluvial fill at the Fort Laramie Quartermaster Dump. Five of these were specifically placed in the suspected area of the "Adobe Corral." Two others were excavated on the east end of the project area to expose the geological strata and assess their relationship to various sedimentary and cultural features.

Backhoe Trench 1 (Figure 6.1) was excavated across an 1890s irrigation ditch

(Figure 1.14) in an area that was a major metallic anomaly (see Figure 4.9). Examination of the sediments exposed in Backhoe Trench 1 were conducted to test the hypothesis that ditch construction followed the south wall of the "Adobe Corral" (see Figure 4.9). No evidence of a wall predating the 1890s era irrigation ditch was present in the exposed sediments. However, both military and post-military (after 1890) cultural deposits were found in the trench. This trench is discussed in detail below.

Backhoe Trench 2 (Figure 6.2) was an east-west trending excavation across what was predicted to be the east wall of the "Adobe Corral." Based on presence of an organic deposit in the trench, two additional trenches were excavated parallel to Backhoe Trench 2. These were Backhoe Trenches 3, placed three meters south of Backhoe Trench 2, and Backhoe Trench 4, placed 11 meters north of Backhoe Trench 2. The soil-sediment relationships in these trenches are discussed in detail below.

Backhoe Trench 5 (Figure 6.3) was placed over what was tentatively mapped as the west wall of the "Adobe Corral," just north of what would have been the Southwest Bastion. No evidence of the wall, or any other, structure was found in the trench. In fact, no evidence of any historic occupation was present in this trench. This is odd considering the area would have been central to the day to day operations of the Quartermaster Corps.

Backhoe Trenches 6 (Figure 6.4) and 7 (Figure 6.5) were placed on the east end of the project area to examine the geological and geomorphic relationships between the alluvial fills, an abandoned river channel and cultural levels in Excavation Blocks Five and Six. Detailed discussion of the geology of these trenches can be found below.



Figure 6.1: View of Backhoe Trench 1, looking south, across the 1890s elevated irrigation ditch.

RESULTS

The study area is associated with a low relief, paired Laramie River alluvial step within the southeastern segment of the Fort Laramie National Historic Site (Figure 6.6). The land form is considered a paired alluvial step rather than a terrace (see Howard 1959) because there is evidence of the land form

being recently inundated. Evidence of recent inundation includes historic accounts (see Anderson 1973) and historic materials buried in its alluvial sediments. The latter are noteworthy. Tracing of military occupation cultural materials from an abandoned channel into the bank (Figure 6.7) provided a marker or vertical depth limit for the backhoe exca-



Figure 6.2: From left to right, Fort Laramie Quartermaster Dump Project Backhoe Trenches 4, 2, and 3, looking east. Main project area just off the right side of photograph.

uations.

Modern soils in the study area are mapped as the Haverson-Bankard association (Stephens et al. 1971:6). Soil development suggests the soil in the study area is primarily the Bankard series, a Ustic Torrifuvent. This is an excessively drained sandy soil. It is characterized as having a grayish-brown loamy fine sand surface unit and two subsurface units. These include a very pale brown fine sand or loamy fine sand and a very pale brown, stratified fine, medium, and coarse sand and gravel (Stephens et al. 1971:12). The fact that these loose sediments are highly erodible is apparent in the unstable cut banks of the Laramie River (see Figure 1.3). Fluvents are relatively young soils formed on active alluvial plains (Stephens 1961:86).

The tread or surface of the alluvial step was approximately 3.46 m above the Laramie

River on July 19, 1994. The elevation of the tread above the river and its relationships to other alluvial land forms at the site (see Anderson 1973) suggests correlation with a late Holocene alluvial fill in north-eastern Wyoming known as the "Lightning terrace" (Leopold and Miller 1954). The type locality for the Lightning terrace is at Lance Creek, Wyoming. Recent work in the Newcastle, Wyoming, vicinity suggests the deposition of Lightning fill began approximately 510 years B.P. (Smith and McFaul 1994). Lightning Terrace fill is characterized as:

"... light-brown to tan, silty, fine or medium sand containing occasional lenses of fine gravel or coarse sand but generally devoid of bedding . . . No soil profile exists at its surface . . ." (Leopold and Miller 1954:11).



Figure 6.3: Backhoe Trench 5, Fort Laramie Quartermaster Dump Project, looking west toward the Commissary Building.

Previous research at Fort Laramie (Anderson 1973; Husted 1963) suggested the next higher elevation alluvial surface, which is north of the present study area, correlates with the regional "Moorcroft Terrace" (Leopold and Miller 1954). This suggestion was

based on the elevation of the alluvial surface above the Laramie River, similarity of its sediments to the type locality (see Leopold and Miller 1954:11), and its soil profile (Anderson 1973:21). Anderson (1973:21) noted two sediment units of alluvial origin and a capping deposit of possible colluvial or



Figure 6.4: Fort Laramie Quartermaster Dump Backhoe Trench Six, looking south toward the Laramie river and Excavation Block 5 (under the netting).

aeolian origin. Cultural materials from the lower portion of the third or youngest sediment unit were estimated to be 3500 to 3300 years old (Husted 1963:21; Anderson 1973:18).

The oldest Moorcroft sediment exhibits an indurated, light gray (10YR7/2 d = dry)

accumulation of calcium carbonate (Anderson 1973:17). The presence of the indurated horizon also implies an age greater than that assigned to the Moorcroft Terrace (see Kaycee Formation discussion in Leopold and Miller 1954; rates of carbonate accumulation in Gile et al. 1966; Karlstrom 1988; Mach-



Figure 6.5: Fort Laramie Quartermaster Dump Project Backhoe Trench 7, looking east toward Block Excavation Seven, at far end of trench. Near end of trench at intersection with Backhoe Trench 6.

ette 1985). Recent work near Newcastle, Wyoming, suggests the Moorcroft terrace dates approximately 3000 to 2700 years B.P. (Smith and McFaul 1994). Considering the importance of land form delineation to this evaluation, it is important that the indurated calcareous soil horizon was not encountered

in any of the soil-sediment profiles in the study area (Figures 6.7 and 6.8).

The Lightning alluvial step at Fort Laramie is characterized by a basal unit consisting of more than 2.5 meters of lensed, pale brown (10YR6/3 d), coarse and fined-grained channel sands. The gravelly units

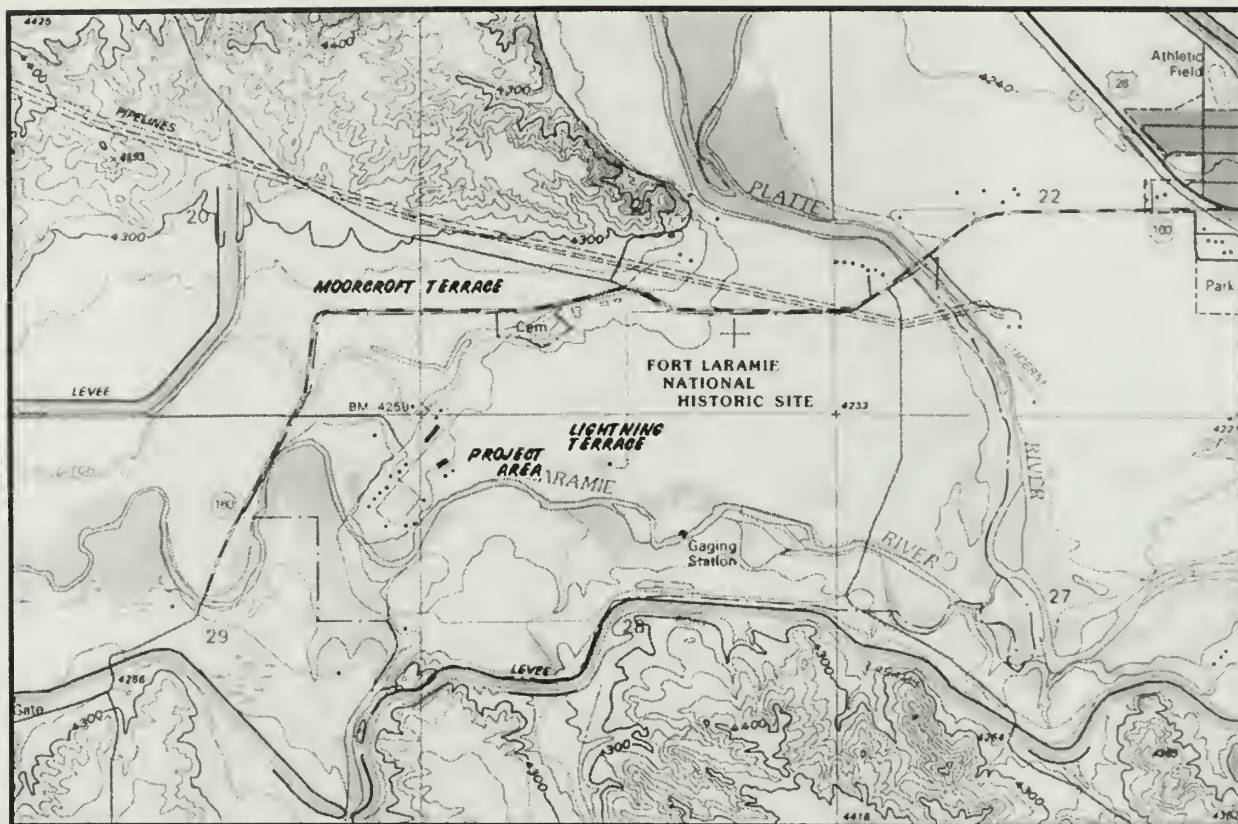


Figure 6.6: Topographic map of Fort Laramie National Historic Site, showing study area relative to topographic land forms of the historic site.

exhibit some horizontal bedding, whereas some sands are cross-bedded. Sands are moderately well sorted, medium-sized grains of clear quartz. Generally, the loose ($p=0.0$ kg/cm² [resistance (kilograms) of surface (centimeter²) to penetration]) channel sediments fine upward and are non-calcareous. Approximately 40-90 cm below the surface, the channel sands are mantled by discontinuous deposits of gray (10YR6/1 d) to pale brown (10YR6/3 d), massive, clay-rich overbank alluvium (Backhoe Trenches 2, 3 and 4; Figure 6.7). Northward from the river (Backhoe Trenches 3 and 4; Figures 6.3 and 6.7), a weak Inceptisol is present in the overbank alluvium. It is characterized by a Mollic colored A horizon and two calcareous Bk horizons. The A horizon is very dark

gray (10YR3/1 m = moist), whereas the calcareous Bk horizons are gray (10YR6/1 d) and pale brown (10YR6/3 d). The Bk horizons are also slightly hard ($p = 2.5$ kg/cm²) with weak, medium subangular blocky structure and many to common (18-30%) fine, irregular carbonate filaments. In most backhoe trenches, the alluvial sediments are mantled by two or more historic cultural deposits. Horizontal tracing of cultural units in Backhoe Trench 6 suggests the lower cultural unit represents the U.S. Army occupation of Fort Laramie. The lower cultural deposit is a firm ($p = 2.5$ kg/cm²), dark brown (10YR5/3 d) clay that reacts strongly to 10% hydrochloric acid.

In turn, the lowest cultural level is mantled by other cultural and alluvial units. The

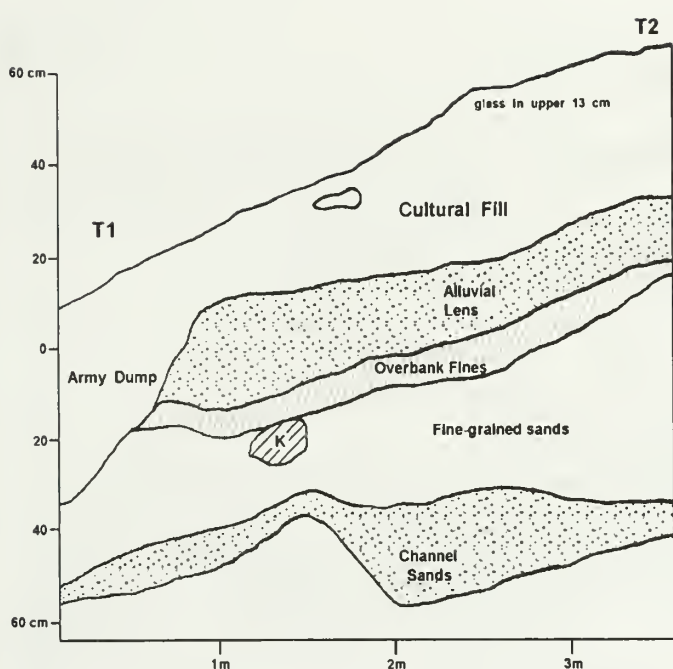


Figure 6.7: Soil-sediment relationships on east wall of Backhoe Trench 6, Fort Laramie Quartermaster Dump Project Area.

sandy and silty alluvial units are different in thicknesses and color (Pale brown [10YR6/3]) and grayish brown [10YR5/2 m]). The alluvium also ranges from slightly hard ($p = 2.0 \text{ kg/cm}^2$) to loose ($p = 0 \text{ kg/cm}^2$) compaction and is slightly to strongly calcareous. The modern Inceptisol (A/AP/C horizons) is developed in a dark grayish brown (10YR4/2 m) to very dark gray (10YR3/3 m) surface alluvium. The soft ($p = 1.0 \text{ kg/cm}^2$) A horizon of the modern soil has sandy loam texture and weak, very fine, granular structure. Cultural units above the military level are generally dark brown (10YR3/3 d), soft ($p = 0.5 \text{ kg/cm}^2$) and non to slightly calcareous.

All the backhoe trenches exhibit historic alluvial deposits and most appear to have received greater than 60 cm of deposition since the military occupation. For example, in Backhoe Trench 1, alluvial sands mantle a post-military concrete irrigation ditch (Figure

6.7; see also Figure 8.19). Interestingly, alluvial deposition is considered episodic and not representative of the recent trend of river incision. This trend is represented by the elevation of the abandoned channel (see Backhoe Trench 6) approximately 2.3 meters above the modern Laramie River (Figure 6.6). The presence of military occupation cultural materials (A.D. 1849-1890) in the abandoned channel indicates channel incision began before A.D. 1890. An aside to incision is that a correlation may exist between channel abandonment and the end of the Little Ice Age or Arapaho Peak glacial advance (Benedict 1981).

Considering the thickness of historic alluvial deposition, a key geoarcheologic task was to insure that trenches were excavated to depths that exposed all the historic sediment. This was accomplished by tracing cultural and alluvial fills (especially in Backhoe Trench 6) and continuous on-site evaluation of the age of the cultural fills. Some interesting cultural features were observed in the trenches. Of these, the clay deposit in the buried irrigation canal (Backhoe Trench 1) is significant (Figure 6.8). It is representative of the blanketing nature of the alluvial deposition and its capacity to preserve cultural materials in situ.

The problem remains, after such an intensive investigation, why weren't the corral walls located? Five possible reasons are proposed. The most obvious is that the trenches were not deep enough or were in the wrong place. Based upon tracing of the military occupation cultural level however, the trenches were deep enough. Second, since the study area experienced many post-military occupation floods, the corral walls may have been washed away. This is possible, but the fine-grained nature of the post-military occupation sediments and the pres-

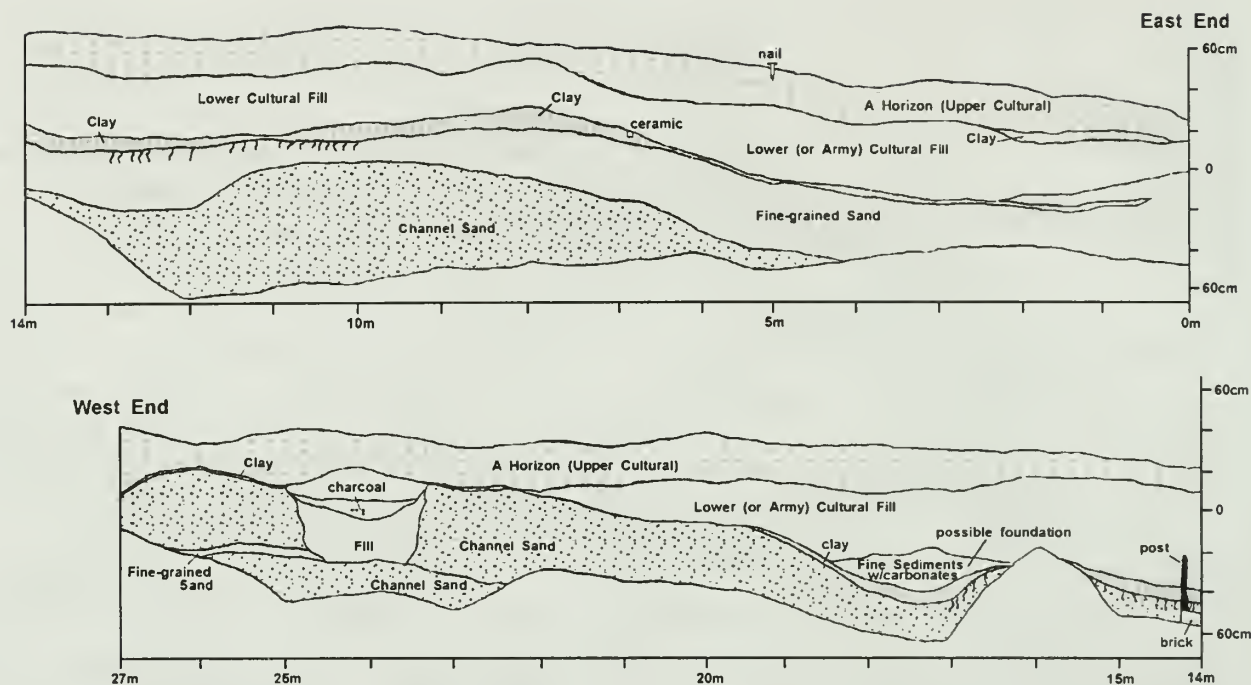


Figure 6.8: Soil-sediment relationships in Backhoe Trench 2 at Fort Laramie Quartermaster Dump Project Area.

ervation of many post-military occupation cultural features, including the clay-lined canal (Backhoe Trench 1) discount this explanation. Third, the possibility exists the walls were constructed of some material other than adobe, such as sod (Danny N. Walker, personal communication, 1995). However, we only noted one small organic-rich deposit (Backhoe Trench 2) that could

be a remnant of such a wall (Figure 6.7). It is worth contemplating that the adobe bricks (if this were the construction material) may have been removed and reused elsewhere at Fort Laramie. Finally, it also should be noted that the lack of evidence for the corral walls might be a combination of all the above factors.

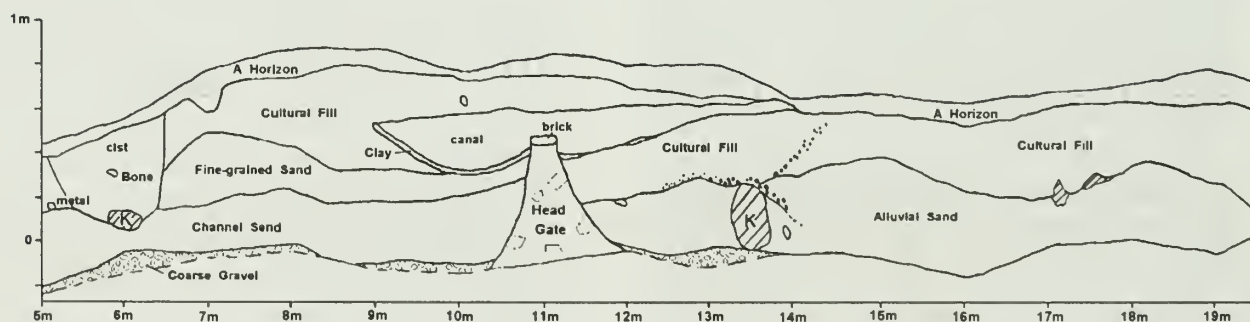


Figure 6.9: Soil-sediment relationships in Backhoe Trench 1 at Fort Laramie Quartermaster Dump Project Area.

CHAPTER 7

THE DISTRIBUTION OF CULTURAL RESOURCES AS REVEALED THROUGH AN AUGER SURVEY AT THE FORT LARAMIE QUARTERMASTER DUMP

by
Jason M. LaBelle

INTRODUCTION

The use of sampling procedures for the location and assessment of archeological deposits is one component of cultural resource management that has greatly expanded during the last thirty years. For example, the minimal impact methods of core and auger testing have been successfully employed for correlating site stratigraphy over large areas, and for delimiting site boundaries and locations (Stein 1986, 1991; Schuldenrein 1991).

However, many of these sampling procedures are used solely as "spot" checks and are not applied systematically within the scope of a project. The work completed during the summer of 1994 at Fort Laramie's Quartermaster Dump employed a multi-procedural research design that used hand excavations, geophysical surveying, and subsurface sampling techniques. These procedures were used systematically over the course of investigations and helped strengthen proposed hypotheses by combining multiple lines of evidence from a diverse set of germane data.

The hand excavations and geophysical prospecting are handled in other sections of this report (Chapters 4 and 8). Two addi-

tional procedures, a collection survey of the riverbank area and an intensive auger survey, are described in this section.

THE RIVERBANK SURVEY

The mitigation project completed at the Quartermaster Dump used multiple means of discovering and recovering *in situ* materials located next to the Laramie River. However, to maximize the amount of artifacts recorded in excavation, high density areas had to be located. Two techniques were employed before excavation to locate any densely clustered areas of artifacts or features: a riverbank survey and geophysical subsurface prospecting (Chapter 4).

The riverbank survey was an attempt to locate concentrations of artifacts along the Laramie River. Although the artifacts collected were deposits from secondary contexts, they nevertheless were recovered in clusters. The clusters were thought to represent approximate distributions of cultural deposits, as the amount of horizontal movement of artifacts downstream appeared minimal, due to the tight spatial association of the objects recovered (the lack of dispersion is probably related to the mass of objects).

The survey covered a transect of 120

meters and collected materials washed onto the riverbank from an easting of E860 to E980. The transect was gridded into five m sections with each section serving as an arbitrary provenience for the materials collected. Groups of three workers shoveled loose sediments, artifacts, and sand into 1/4 inch screens. The recovered material and its generalized provenience allowed for the identification of dense areas of cultural debris.

Two large clusters of artifacts are evident along the riverbank (Figure 7.1). The first is around the area that was to become excavation Blocks One and Two, and the second around the area that was to become excavation Blocks Three and Four. As with the recovered materials from excavations, the most common items documented in the

survey were metal and glass fragments.

The spatial distribution of materials allowed for the placement of excavation units in areas with high density cultural deposits and areas where artifacts were eroding from the cut banks (the areas of secondarily deposited clusters and where artifacts were seen in profile were usually the same). The riverbank survey not only located aggregates of artifacts but also provided evidence for assemblage differences between the clusters. Intrasite distinctions of certain types of artifacts were seen in the distributions. The highly diagnostic (and non-utilitarian) materials recovered in excavation Blocks One and Two were also recovered in the riverbank survey -- patterned pieces of china, and teeth to a comb (more teeth from the comb were subsequently located in excavations of Block

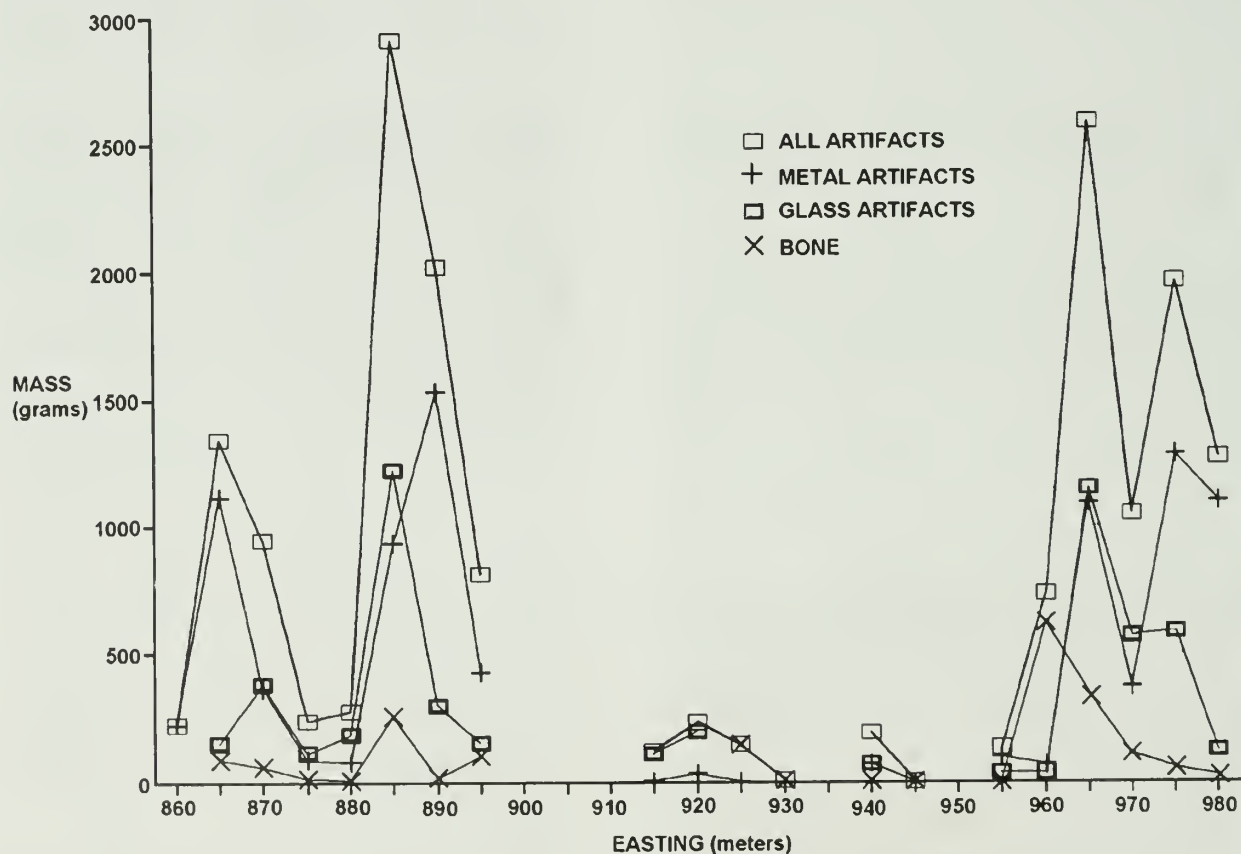


Figure 7.1: Distribution of artifacts, by type, along the Quartermaster Dump riverbank survey.

Two). In addition, diagnostic period pieces such as .45-70 cartridge cases and shotgun shells were recovered along the bank.

Thus, with the completion of both the geophysical testing and the riverbank survey, deposits were located that appeared to have the highest density of materials and the greatest need for excavation and collection (Chapter 8). However, the areas that linked the excavation blocks had to be tested to determine whether any subsurface materials were present but not located with the geophysical testing or the riverbank screening. An auger survey, completed during late July and early August 1994, tested areas that had not been sampled.

THE AUGER SURVEY

The auger survey was primarily an attempt to evaluate the success of the placement of the excavation units. It was believed that the geophysical prospecting and clusters of materials along the riverbank provided the best information concerning the spatial distributions of artifacts in the Quartermaster Dump area, and therefore the excavation units were placed in the highest density areas; a preliminary hypothesis was that the auger survey would recover, at best, isolated finds located between the excavation block areas. In addition, the auger survey allowed for three other research questions to be proposed and tested. First, are there *distinct* breaks in artifact concentrations (i.e., density) between excavation Blocks One and Two and between excavation Block Two and Blocks Three and Four? Second, can the auger be used to differentiate different artifact types and thus locate different dumping episodes? Third, can an auger survey be used to help evaluate large areas quickly for purposes of impact mitigation?

AUGER SURVEY METHODOLOGY

Three separate areas were gridded for an intensive auger survey. These included the area to the west of Block One (E856-E861), the area between Blocks One and Two (E875-E884), and the area between Block Two and Blocks Three and Four (E895-E961). In total 172 auger holes were tested in these three areas, with 20 (11.6%) in Auger Block One, 19 (11%) in Auger Block Two, and 133 (77%) in Auger Blocks Three, Four, and Five, (see Figure 3.2).

The auger holes were placed in a gridded fashion (Figure 7.2), occurring every other meter on an easting line. Northing lines were placed a meter to the side of the easting lines, so that the auger hole distributions formed a series of parallel diagonals. The easting lines were offset approximately four meters from the edge of the riverbank to approximate the same offsets used in block excavations.

The machine employed was a two-man gasoline powered auger with an eight-inch bit. The time saved using a gasoline powered auger with a large bit, as compared to a smaller bucket auger, allowed more holes to be augered and a larger sample from each hole. Also, although breakage caused by sampling with an auger is more frequent than that of hand excavations (Howell 1993), the gasoline auger used a "threaded screw" process of sediment extraction and therefore minimized at least some breakage as compared to a traditional bucket auger. A drawback to the gasoline powered auger was the inability to recover relatively intact sediments in some sort of stratigraphic context. However, the specific context of recovered material from the Quartermaster Dump was less important because the stratigraphy consisted of a thin horizon of occupational debris with most archeological materials in a 10-15 cm

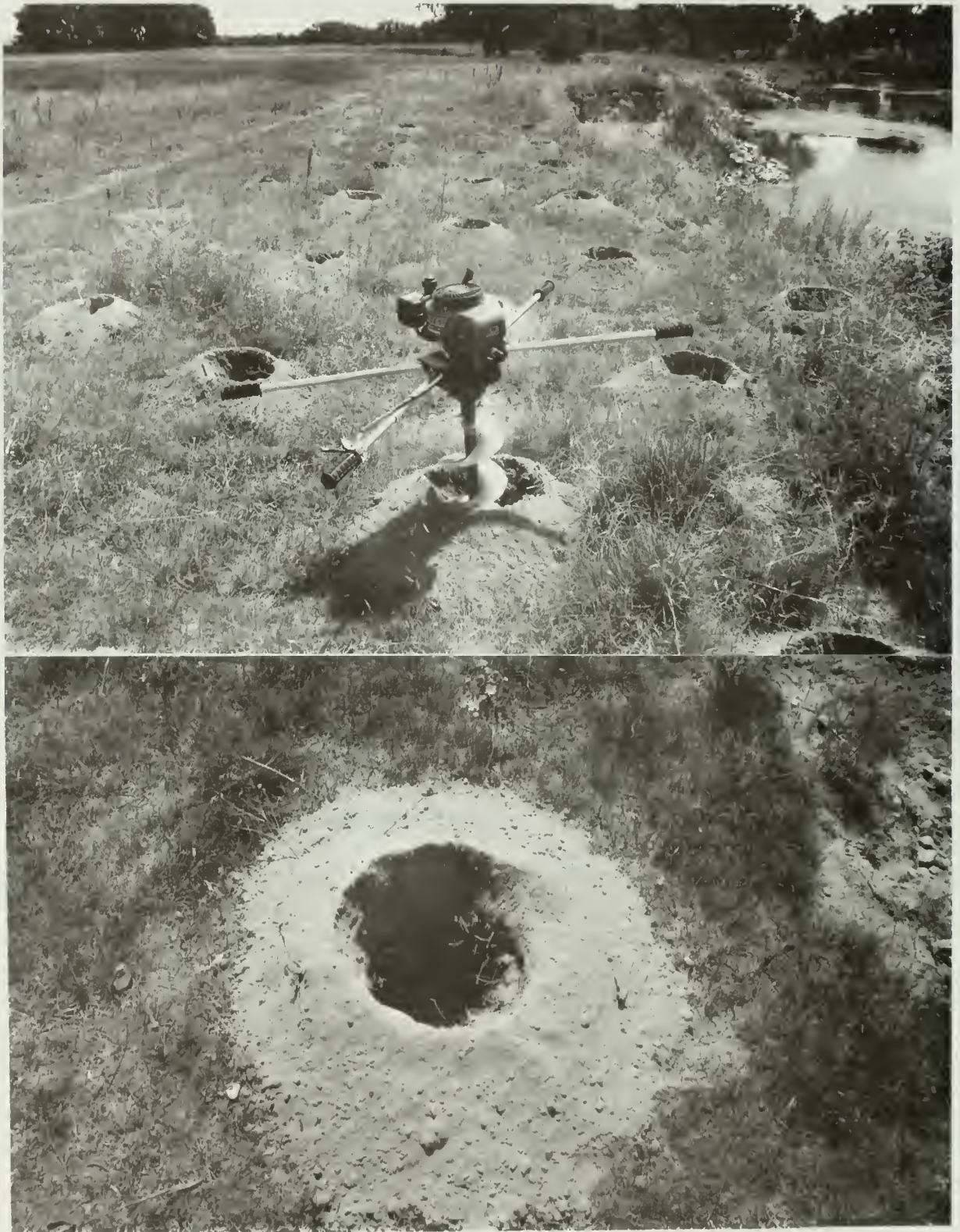


Figure 7.2: Upper: Auger Blocks three to Five, showing grid pattern and auger. Lower: Closeup of auger hole, showing size of hole and excavated sediment.



Figure 7.3: Distribution of rocks along the Quartermaster Dump Auger Block survey.

thick level (based upon excavation).

Each auger hole was drilled to a depth of approximately 40-50 cm below ground surface. The 50 cm cutoff depth was deemed appropriate due to the lack of cultural materials found below that level in excavations and additionally, sterile gravels of Pleistocene age were found near the 50 cm contact.

Individual auger blocks were drilled, and the sediments left in place to be subsequently screened. The recovery of the auger samples consisted of scooping out any loose sediments or artifacts that had fallen back into the auger hole and the collection of sediments that were on the ground surface. The material was screened through 1/8 inch wire mesh to recover small debris. Besides artifacts, both gravels and cobbles were bagged from each hole to assess the usefulness of a power auger survey at determining geomorphological land forms. The large gravel bar intersecting the bank of the Laramie River is easily identified (Figure 7.3); the break between the gravel bar and other

sediments is clearly seen around the E915 line.

GENERAL RESULTS

Of the 172 holes augered, 23 did not contain any cultural material; the remaining 149 holes contained a total of 2082 individual objects with a total weight of 2662.66 grams. A presence/absence table reveals a very rich distribution of cultural artifacts. As a whole, 52% of the holes contained charcoal remains, 70% contained glass fragments, 58% contained metal fragments and 29% contained bone remains. The frequency of the five most commonly recovered materials in each particular auger block can be documented (Table 7.1). There is a strong representation of the materials in each auger block, except porcelain, which has the highest frequency in Auger Block Two, the area already noted as having large deposits of non-utilitarian and highly diagnostic materials.

Therefore, the conclusion can be drawn that the landscape surrounding this historic dump is very rich in cultural debris; the high

Table 7.1: Number and percentage of auger holes with artifactual material recovered.

| Auger Block | Charcoal | Glass | Metal | Porcelain | Bone |
|-------------|----------|--------|--------|-----------|--------|
| 1: E856-861 | 2 (10%) | 9(45) | 4(20) | 2(10) | 5(25) |
| 2: E875-884 | 11(58) | 17(89) | 15(79) | 11(58) | 9(47) |
| 3: E895-919 | 13(29) | 39(87) | 32(71) | 6(13) | 8(18) |
| 4: E920-940 | 39(87) | 32(71) | 23(51) | 6(13) | 20(44) |
| 5: E941-961 | 25(57) | 28(64) | 24(55) | 4(9) | 10(23) |

recovery rate illustrates the potential usefulness of an auger survey at historic sites (as compared to many prehistoric sites where artifact densities are rarely as high as historic dumps and therefore surveys are more likely to recover lower numbers of objects).

INTERPRETATION OF THE AUGER HOLE RESULTS

The results of the auger survey were certainly encouraging. Large numbers of artifacts were recovered from most of the holes, and the distribution of the items allowed for the testing of the stated hypotheses. However, to interpret the distribution of artifacts across auger blocks, guidelines had to be established to identify "significant" areas of artifact clustering.

Several components of the catalogued items were entered into a database for further processing. These included the spatial coordinates of the object, the frequency of the particular category of artifact (such as number of pieces of green glass or metal nails), and the weight of each particular type. Thus each auger hole (x) could be identified as having a total amount of items (y_{tot}), with a total weight of (z_{tot}), or each auger hole (x) could be identified as having a number of pieces of glass (y_{gls}) with the weight of the glass (z_{gls}).

Each auger block was then processed with the Surfer computer program (Topo map version 4.05); each of the common item classes was computed separately. In all, maps were produced for the individual artifact classes of metal, glass, bone, and diagnostic material (Auger Block Two only). Additionally, maps were produced that contained the summed data of all artifact classes for each particular hole.

Separate topographic maps were created using the above artifact classes and were produced with two types of frequencies

(contour intervals): one set of maps with the number of objects per hole and another set with the sum weight of objects per hole. Comparison of the two sets of maps proved to be useful in that they generally had overlapping distributions of peaks. This is not surprising in that enumeration of objects also increases the total weight of the summed objects. However, this principle also illustrates the potential problem of using an item count in evaluating the distribution of objects from an auger survey (or any potentially intrusive survey method). The auger can (and did) increase the number of objects recovered by breaking larger objects into smaller objects and thus inflating the value of the item count. Therefore, in the interpretations that follow, maps are presented using the summed weight of the items in the holes.

Each series of maps was produced at the same scale to examine intrasite patterning of artifacts. These scales do not necessarily reflect "natural units" of artifact analysis. However, the arbitrary contour intervals were chosen for their usefulness in integrating all five auger blocks onto one scale. For the series of topographic maps that use the summation of all artifacts recovered from the auger holes, a contour of ten gms was selected (Figures 7.4, 7.7, 7.12, 7.16, 7.20). The set of maps describing glass distributions used a scale of five gms per contour interval (Figures 7.5, 7.8, 7.13, 7.17, 7.21). The series of maps dealing with metal artifacts are also presented in five gm contours (Figures 7.9, 7.14, 7.18, 7.22). The series of bone fragment maps are presented in 2.5 gm contours (Figures 7.6., 7.10, 7.15, 7.19, 7.23). The map of diagnostic material (Auger Block Two only) is presented in a one gm scale (Figure 7.11).

The qualitative analysis of the artifact distributions depended upon establishing a

base level of comparison. For this study, an area known to have high quantities of cultural material in both high number of artifacts and a corresponding high weight served as a valid template for determining areas that warrant further test excavations. In addition, areas that contained high amounts of diagnostic materials would be selected for additional excavation. Auger Block Two provided a template for evaluating the four other auger blocks, as Auger Block Two had the highest amount of diagnostic material recovered, a high material recovery rate, and the highest average weight in each particular hole. Therefore, using the template provided by Auger Block Two, analysis of the other auger blocks attempted to determine any

additional locations that contained significant amounts or types of cultural material.

ASSESSMENTS OF THE AUGER BLOCKS

Auger Block One (Figures 7.4-7.6)

The first auger block, located west of excavation Block One, did not contain high frequencies of cultural material. In all, only 50 objects were recovered from the block, with a cumulative weight of 355.95 grams. The distributions of total amounts of artifacts (Figure 7.4), glass items (Figure 7.5) and metal items (Figure 7.6) respectively, can be portrayed.

The interpretation of the artifact distribution in Auger Block One can be depicted (Figure 7.4). As can be seen, two high

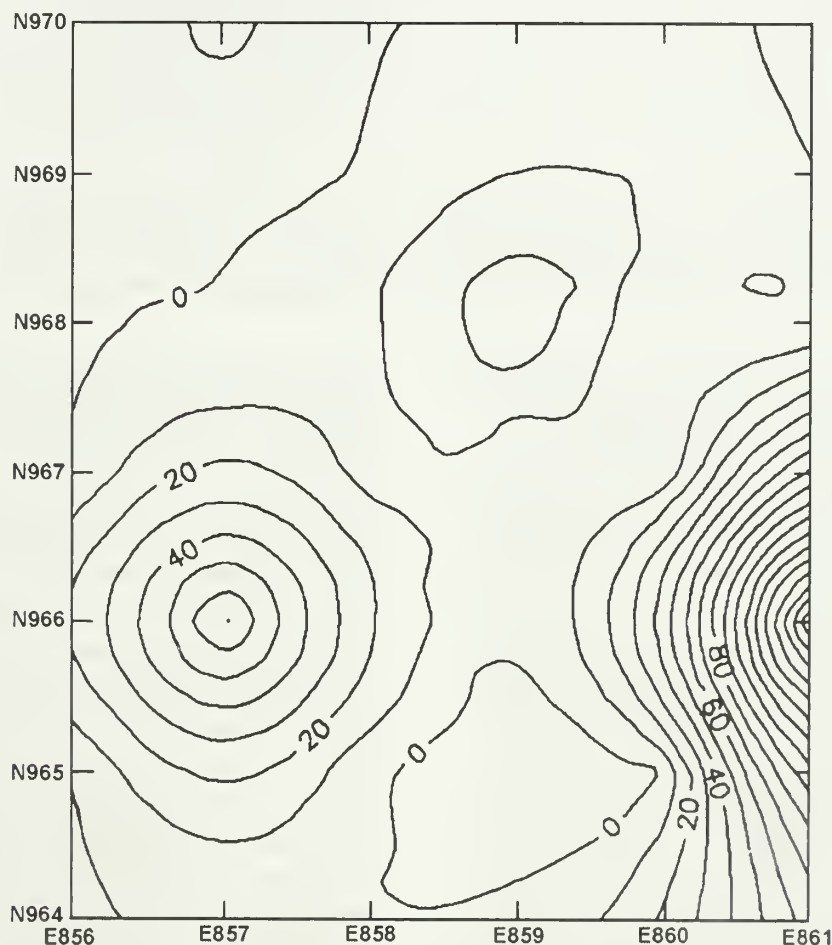


Figure 7.4: Quartermaster Dump Auger Block One: sum weight of all objects.

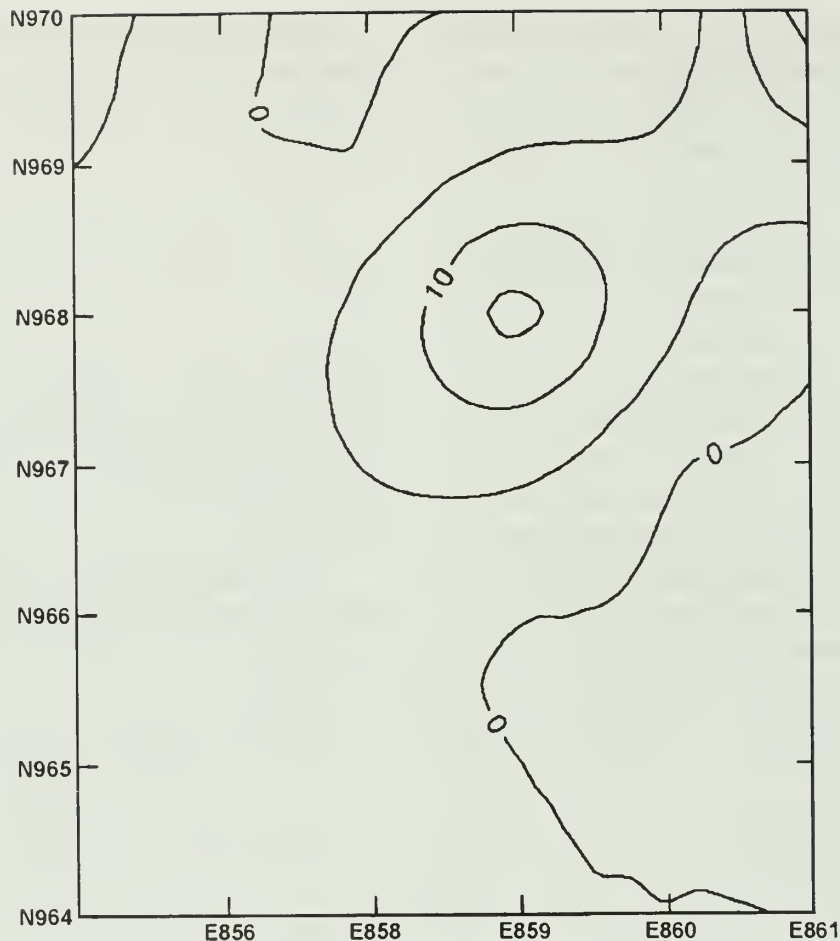


Figure 7.5: Quartermaster Dump Auger Block One: sum weight of glass fragments.

peaks are present. However, to interpret these peaks, a system of recognizing anomalous data must be employed. For example, the high peak at N966 E861 was created by a data point heavily biased by the particular object in that hole, in this case a large piece of an iron pipe.

The slope of the peak is very diagnostic of the anomaly. Areas where there is little material in the surrounding holes will appear essentially flat and a large spike will then designate the location of items with very high weight. On the other hand, lessened slopes such as the slope near N966 E857, indicate areas where there is a high (in weight) concentration of materials in one hole, with

a high weight distributed over several adjacent holes. A less peaked distribution is seen near the area of N966 E857 because the weight of the artifacts (including a *Bos* acetabulum, porcelain fragments, and glass fragments) was spread over several holes. The acetabulum provided the initial weight to display a moderate peak, but the artifacts in the other holes helped spread the base of the moderate peak over a larger area. Therefore, more gently sloping peaks provide evidence for a more continuous distribution of artifacts over a larger area. Important to note, however, is that the steepness of the slope is a product of scale. It is only through the analysis of distributional patterns at

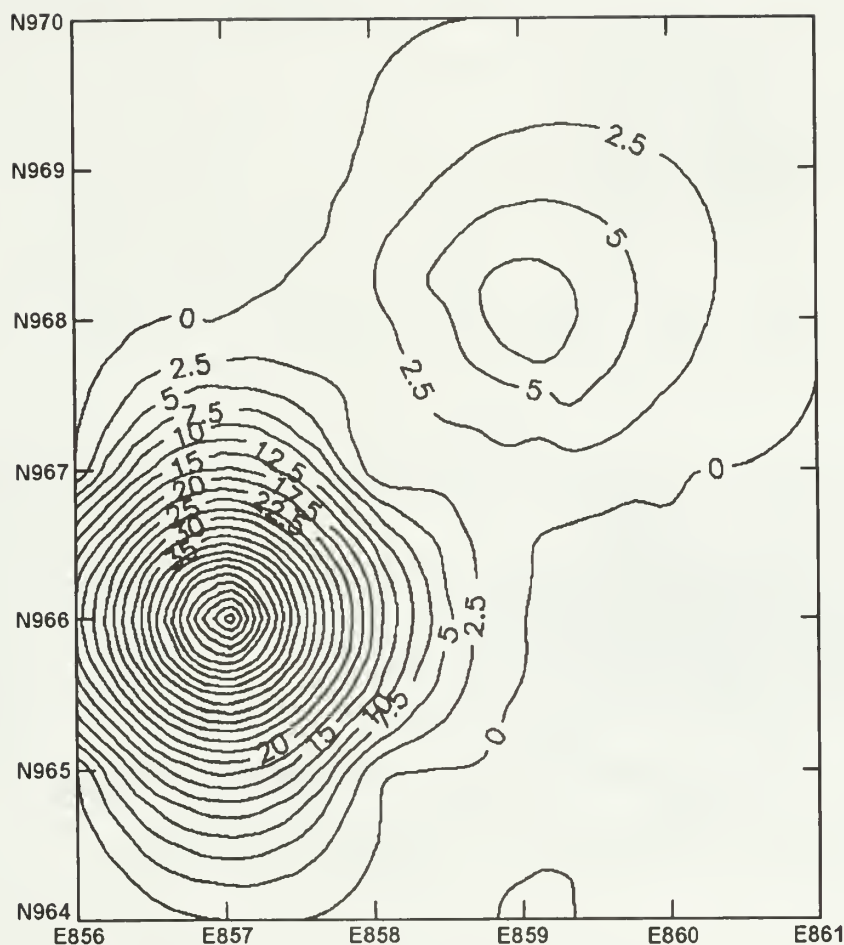


Figure 7.6: Quartermaster Dump Auger Block One: sum weight of bone fragments.

different scales and with different artifact classes that one can differentiate isolated anomalies from actual spatially distinct distributions (Ebert 1992).

Auger Block One is a case of a low artifact density area as compared to the template of Auger Block Two. Thirty percent of the holes contained no cultural materials, there is the peaked artifact distribution with little widespread distribution of artifacts, and there is a lack of diagnostic materials (besides an underwear button). Therefore, a case cannot be made for further archeological mitigation of Auger Block One.

Auger Block Two (Figures 7.7-7.11)

This auger block, bounded between the excavation Blocks One and Two, was an area of slight decrease in artifacts recovered in the riverbank survey (Figure 7.1). It was expected that through an auger survey either a continuity or a discontinuity in distribution of cultural materials would be evidenced between the two excavation blocks.

Auger Block Two was the most densely concentrated of all areas tested; only five percent of the holes contained no material. The high recovery rate of materials in the auger survey was similar to that of the items collected from excavation Blocks One and Two, a high concentration of a diverse set of

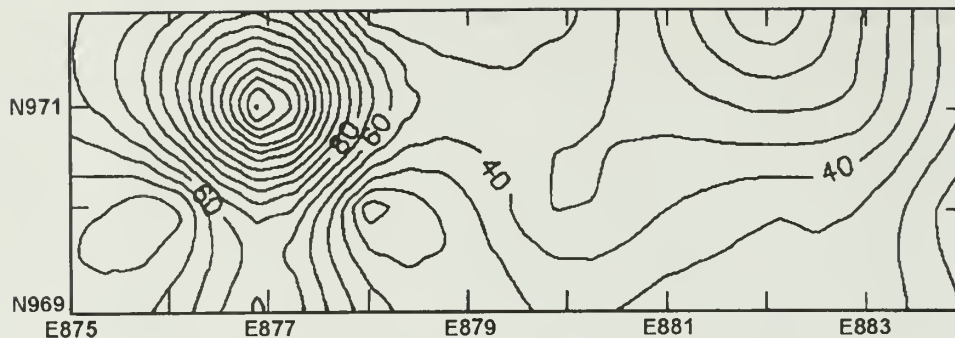


Figure 7.7: Quartermaster dump Auger Block Two: sum weight of all objects.

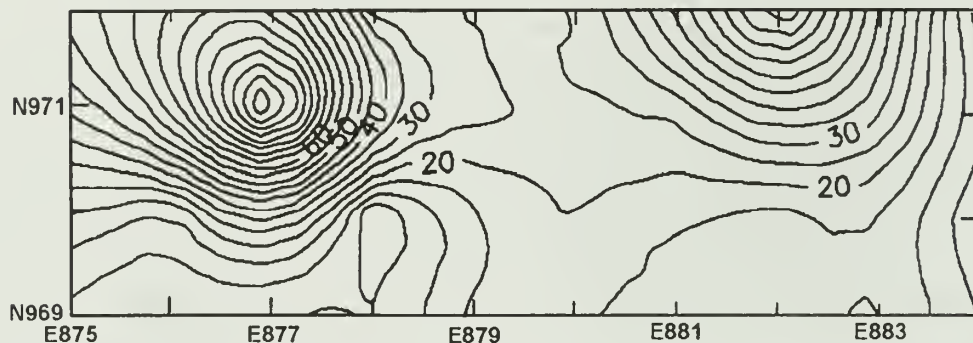


Figure 7.8: Quartermaster Dump Auger Block Two: sum weight of glass fragments.

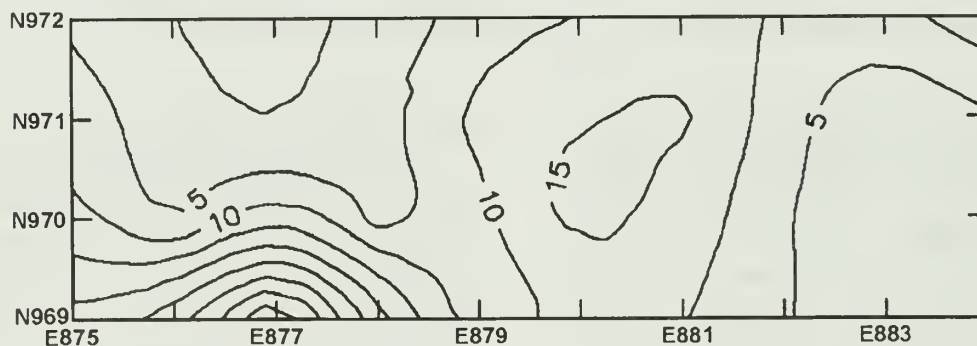


Figure 7.9: Quartermaster Dump Auger Block Two: sum weight of metal fragments.

materials, in particular porcelain and china pieces. Also, 58% of the auger holes had diagnostic material, which is very similar to the high amount of diagnostic material recorded in excavation Block One and Two.

In comparing the distributions of all artifacts (Figure 7.7) with the specific artifact

distribution maps, several different peaks emerge. The largest peak, near N971 E877, associated with large numbers of bottle fragments is similar to N972 E882, another cluster of glass fragments (Figure 7.8). Metal and bone distributions (Figure 7.9 and 7.10) contribute to the wide distribution of

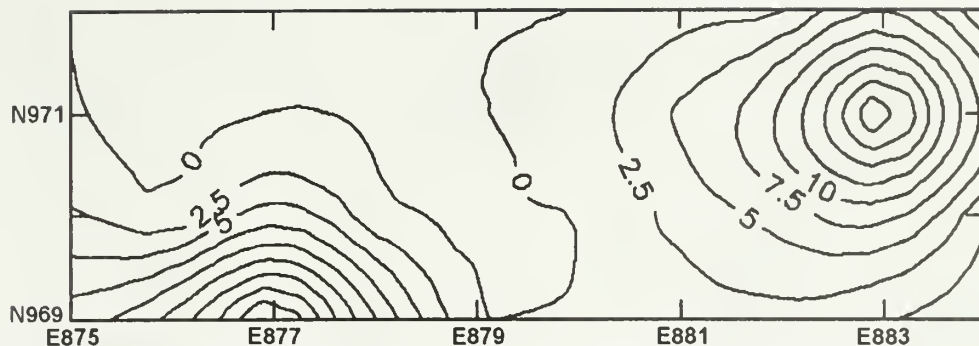


Figure 7.10: Quartermaster Dump Auger Block Two: sum weight of bone fragments.

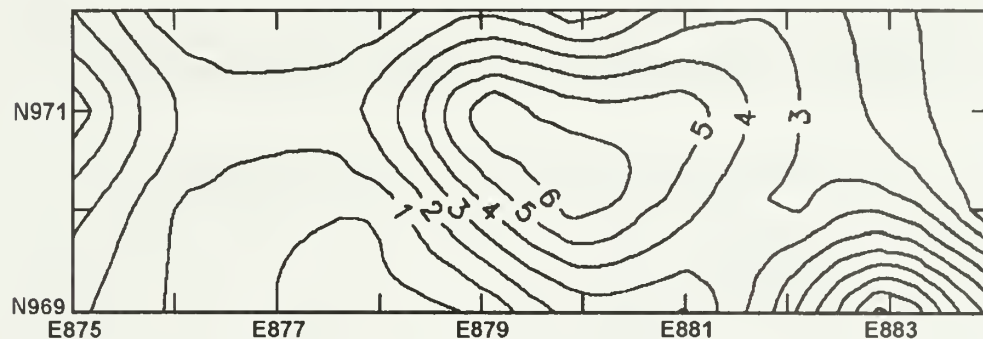


Figure 7.11: Quartermaster Dump Auger Block Two: sum weight of diagnostic objects.

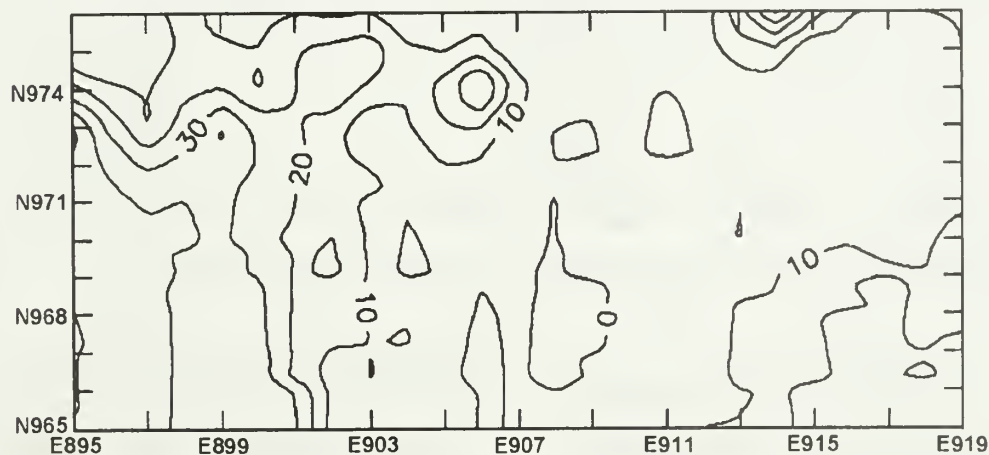


Figure 7.12: Quartermaster Dump Auger Block Three: sum weight of all objects.

artifacts (Figure 7.7). The distribution of diagnostic artifacts (Figure 7.11) is of particular interest. There are several areas of high frequencies of diagnostics; these areas might have warranted further field testing.

The highly frequent diagnostic artifacts included a multi-colored wide mouth bottle lid with J.P.S & CO embossed on the top, a large metal lid to a can (with evidence of

auger breakage), refitted pieces of china, four military buttons, a pipe fragment, two bottle finishes, a nearly complete miniature medicinal bottle, and half an infantryman's cap insignia. Diagnostically, the military button and insignia styles are similar in patterning to others recovered in block excavation in this particular location of the dump, the possible officers' area, which has been

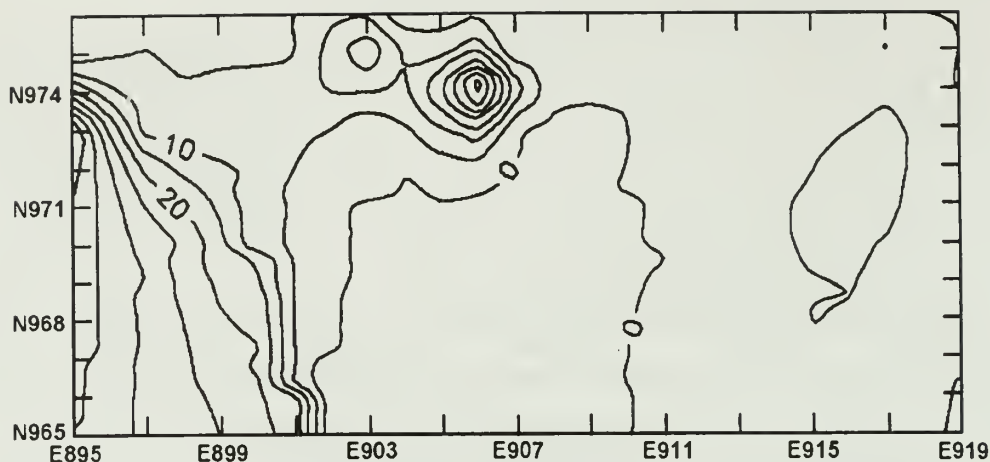


Figure 7.13: Quartermaster Dump Auger Block Three: sum weight of glass fragments.

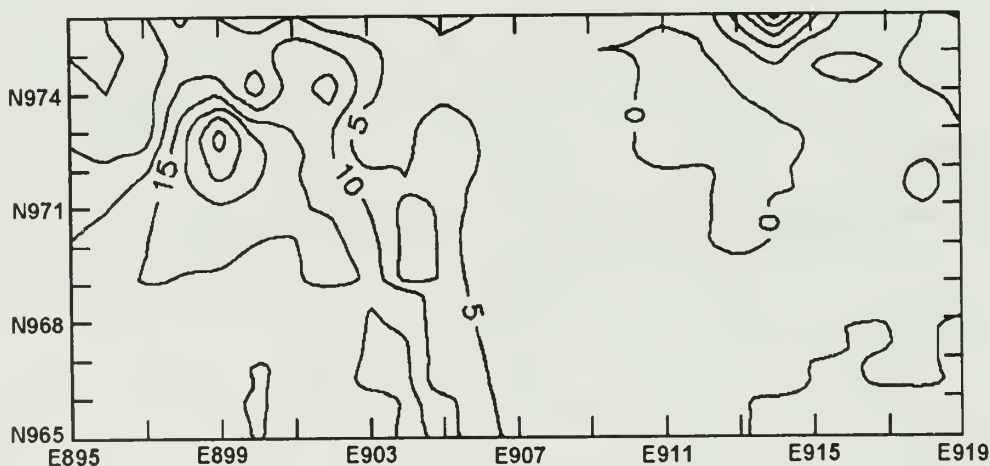


Figure 7.14: Quartermaster Dump Auger Block Three: sum weight of metal fragments.

dated to the early 1880s.

Further excavation of the area between excavation Blocks One and Two would have recovered much of the same types of material recorded in each of the two blocks. Like the two excavation blocks, Auger Block Two had a high amount of cultural material and a high amount of diagnostic material. It would appear, based upon the artifact distributions, there is not a break in cultural deposits between the two excavation areas, however only excavation could confirm this.

Auger Block Three (Figures 7.12-15)

Auger Block Three, E895-E919, is lo-

cated east of excavation Block Two. The auger block started from the eastern end of the block excavation, across the gravel/cobble bar (Figure 7.3), and into a section of the Quartermaster Dump area where little cultural material was encountered on the river-bank survey.

Materials recovered from this auger block (Figure 7.12) show a general distribution of decreasing frequency moving from the edge of excavation Block Two (E895) toward the east. Peaks of bone and metal at N976 E914 are most likely isolated finds, as there is very little extension of material to a

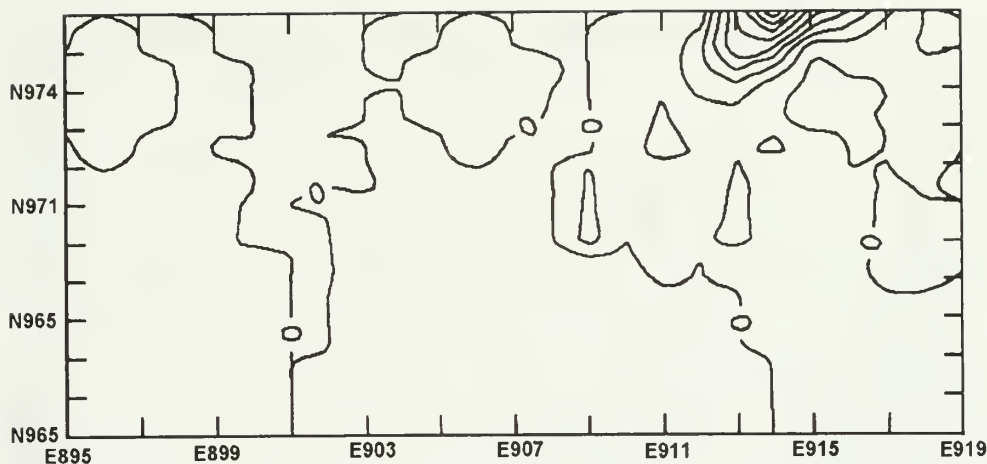


Figure 7.15: Quartermaster Dump Auger Block Three: sum weight of bone fragments.

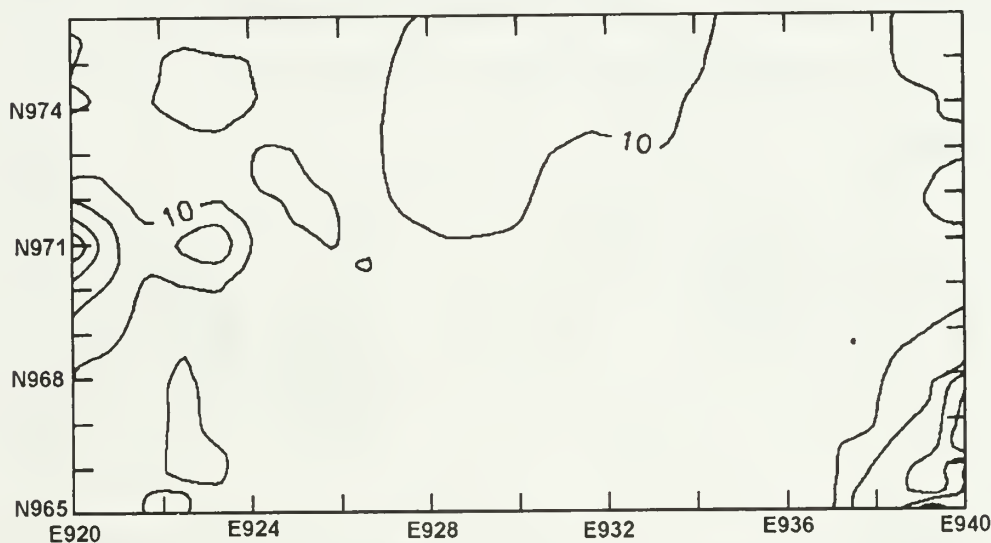


Figure 7.16: Quartermaster Dump Auger Block Four: sum weight of all objects.

larger area (except to the north, where larger deposits might remain). Glass fragments tended to have the largest representation, with large amounts west of E905. A large cluster of glass at N974 E906 likely represents an isolated broken bottle. Also, a sharp drop in the frequency of porcelain recovered may be further evidence of crossing the boundary from the officers' section of the dump.

The average weight per hole for Auger Block Three was very low, with a standard

deviation exceeding the average weight per hole; thus the number of isolated objects is relatively high. The lack of diagnostic material recovered (other than a bottle bottom fragment and one porcelain piece with a maker's mark), the sharp peaks of isolated objects, and a low mean weight lead to the conclusion that there is no need for further excavation in the Auger Block Three location.

Auger Block Four (Figures 7.16-7.19)

Auger Block Four contained relatively

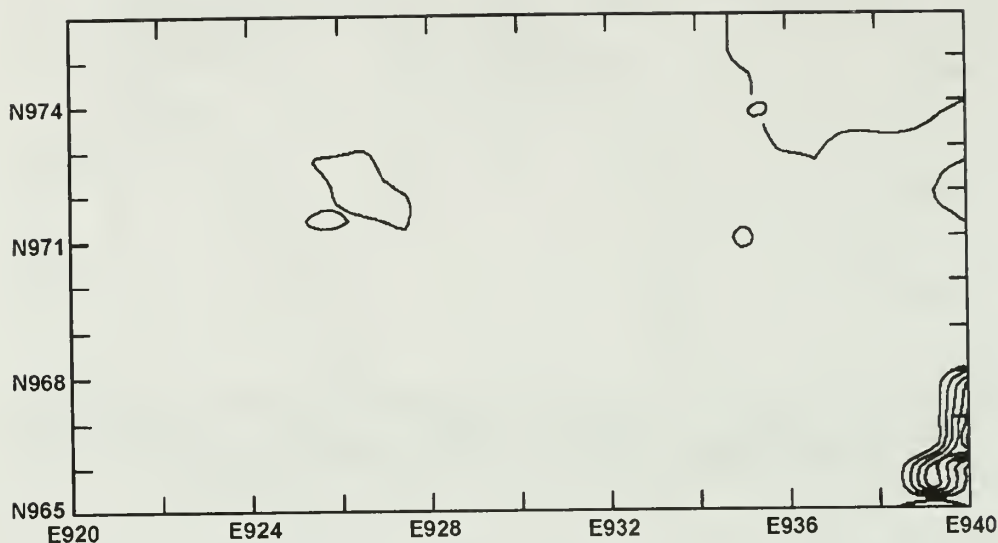


Figure 7.17: Quartermaster Dump Auger Block Four: sum weight of glass fragments.

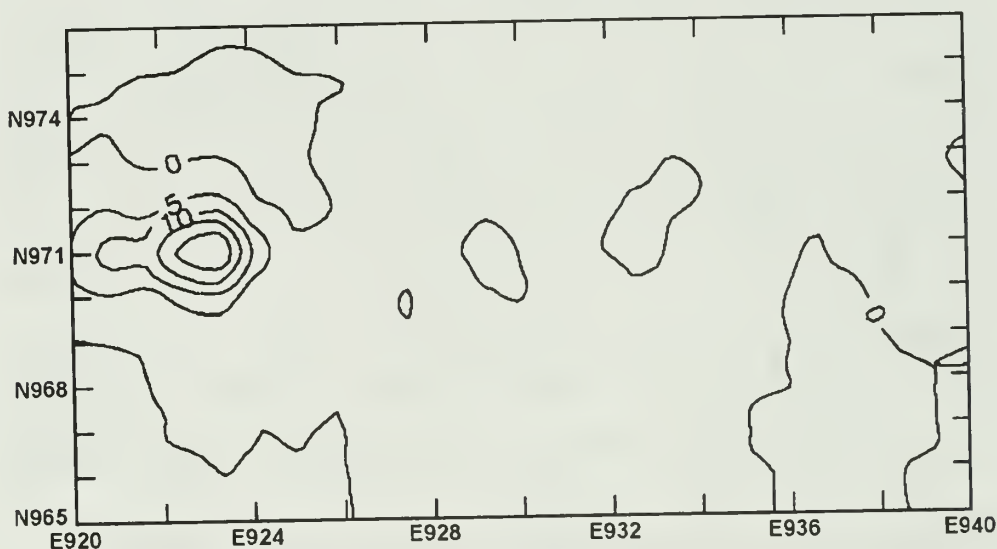


Figure 7.18: Quartermaster Dump Auger Block Four: sum weight of metal fragments.

high proportions of the most common artifacts (Table 7.1), however, the weight of the objects tended to be small. Therefore, examination of the maps from this auger block show they contain little patterning. Of considerable interest, however, is the large distribution of bone (Figure 7.19). Four bones were recovered that contain examples of butchering (medially sawed vertebrae) in the N 971-972 E929-931 area. The origin of the relatively large amount of butchered bone

in this location is an interesting problem. With no associated materials such as glass or metal fragments, it appears possible that the bones were deposited in a single event, perhaps being dropped by someone moving across the dump area, and not deposited as part of an intentional dumping episode that contained high numbers of materials such as in excavation Block Five.

Other noticeable artifacts were very infrequent, although several are worth not-

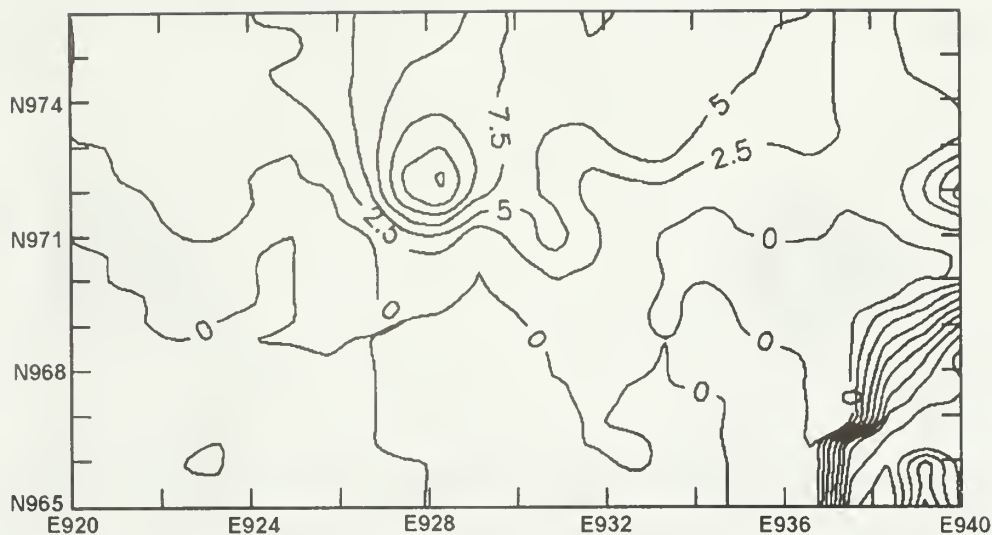


Figure 7.19: Quartermaster Dump Auger Block Four: sum weight of bone fragments.

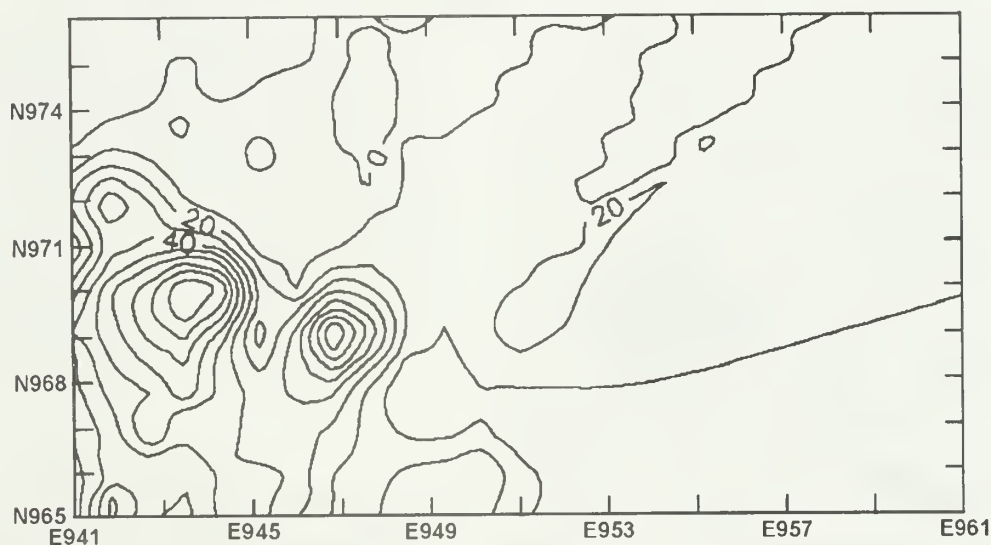


Figure 7.20: Quartermaster Dump Auger Block Five: sum weight of all objects.

ing. Part of a fancy bottle was recovered in N971 E935, however, no other glass was associated in nearby holes. Additionally, a fragment of faded blue wool (possibly part of a sweater) was found at N971 E920. However, the fragment was located within 15 cm of the present ground surface and might not be related to the military occupation of the site.

Because of the lack of substantial amounts of material recovered in this block,

no additional excavation is deemed necessary.

Auger Block Five (Figures 7.20-7.23)

Auger Block Five is the transition to excavation Block Four. This auger block is interesting in that there were a large number of artifacts recovered in a small area. Significant peaks are seen in glass (Figure 7.21), metal (Figure 7.22), and bone (Figure 7.23) maps. The general distributions of material appear to cluster in the N965-972

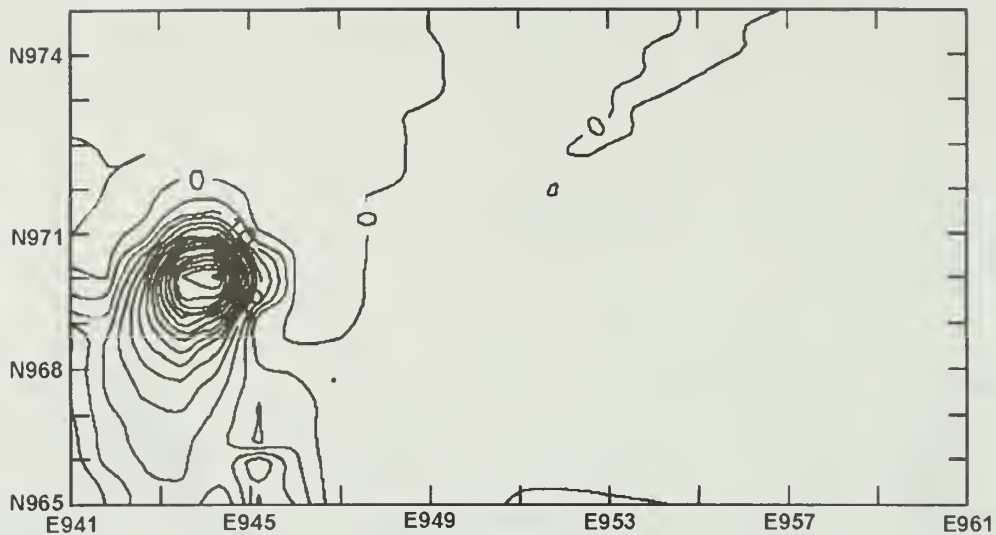


Figure 7.21: Quartermaster Dump Auger Block Five: sum weight of glass fragments.

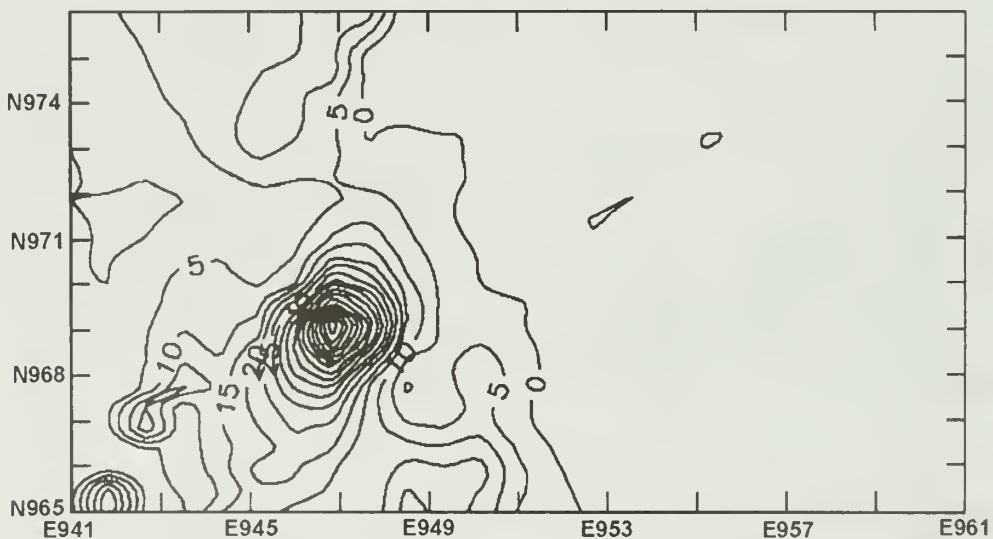


Figure 7.22: Quartermaster Dump Auger Block Five: sum weight of metal fragments.

and E 941-949 area, with a drop in artifacts recovered (east of E950) toward excavation Block Four.

The area with the high degree of clustering contained several pieces of adobe brick, a complete *Bos* carpal set, a sawed *Bos* vertebrae, and large concentrations of metal (nails) and glass. Diagnostic material recovered in this clustered area included a wagon part (N969 E947) and a bottle finish and bottom. In addition, a 12-gauge shotgun

shell (UMC CO. No 12) was recovered from N966 E956, an area not associated with the clustering.

The high degree of clustering of multiple types of artifacts seems to suggest a need for additional ground testing. The large amounts of adobe brick could be portions of a structure, although no signs of a structure were located by geophysical testing in this area. It appears that many of the large spikes are individual objects, but the total representa-

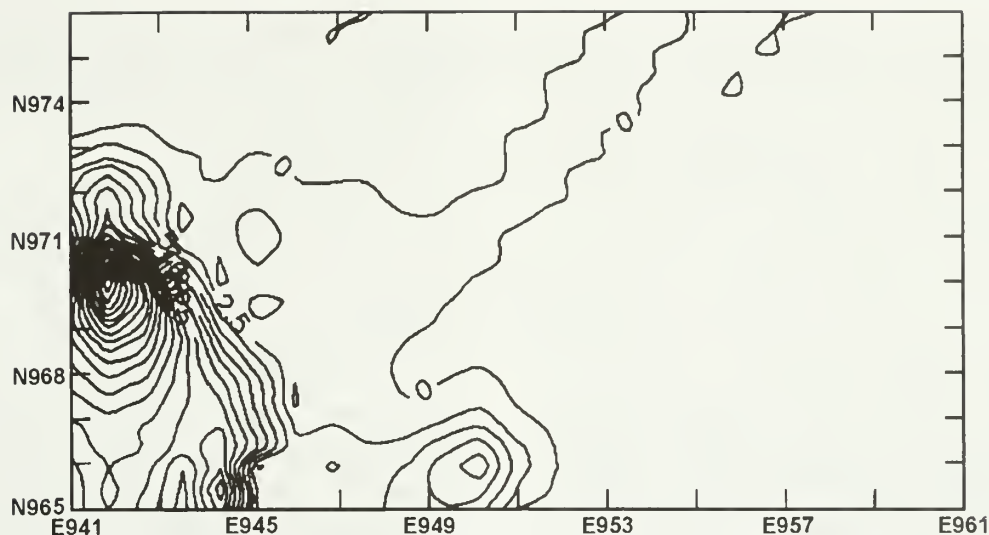


Figure 7.23: Quartermaster Dump Auger Block Five: sum weight of bone fragments.

tion of a diverse set of artifact classes is of interest. The diversity of the artifact assemblage makes it seem unlikely that individual objects were dropped one by one in a clustered spot. It is possible that the artifacts were deposited as a group in a single event. However, the area where the cluster occurs is relatively small and probably not indicative of a *large* scale dumping episode as seen in the excavation blocks.

CONCLUSIONS

Based on the auger survey of 172 holes, there is enough evidence to answer the four research questions previously proposed. First, the auger test confirmed a general lack of materials west of excavation Block One (Figure 7.4) besides one peak (the piece of iron pipe) and an isolated pocket of materials. Auger Block Two (Figure 7.7), shows that *there* is continuity between excavation Blocks One and Two. Further ground testing could possibly have been done to assess the high volume of materials in this location. Auger Block Three (Figure 7.12) showed moderate concentrations of material to the east of excavation Block Two, but a large

drop in artifact numbers moving further past the gravel bar; distributions beyond the gravel are evidenced by a few isolated finds. Auger Block Four (Figure 7.16) contained relatively little amounts of material, although the concentration of butchered bone is an interesting dump event. Auger Block Five (Figure 7.20) contained several anomalies worth testing. The presence of a diverse set of artifacts with large weights, as well as large chunks of adobe brick, might be representative of another relatively small dump episode (although no diagnostic military material was recovered, and therefore little or no temporal control).

Second, the auger survey was useful in locating topologically different artifacts between the metal dump and officers' dump portions of the Quartermaster Dump area. The dense concentrations of material in Auger Block Two (with nearly identical artifacts as ones recovered in excavations) and the lack of diagnostic material in Auger Blocks Three, Four and Five leads to the conclusion that the patterning recognized was representational of below ground resources. The auger block distributions were useful as

samples of the nearby excavation units. For example, the distributions of color and type of glass recovered in the three main auger blocks can be shown (Table 7.2). The officer areas contained types of "exotic" glass not seen in the other areas of the dump, for instance, the cobalt blue and red glass. Common glass types, such as beer bottle glass, were seen more frequently in the more utilitarian portion of the dump, or in Auger Blocks 3, 4 and 5. Note that the distributions presented (Table 2) are not corrected for the discrepancies between the number of holes in each auger block; the distributions are more representational of presence/absence qualities. Thus, differences in artifact types are probably resultant from different dumping episodes.

Third, the auger survey has shown that the excavation blocks were put in appropriate areas as defined by the remote sensing and riverbank survey data, with the possible exception of Auger Block Two, where more material might have been recorded. Certain anomalies were not foreseeable with the remote sensing and the riverbank survey, for example, the clustered region in Auger Block Five. However, it must be said that the

riverbank profile in Auger Blocks Two and Five was cleared of cultural resources and therefore there is little threat to the in situ cultural deposits.

Fourth, the auger survey was an inexpensive and efficient means of mitigating a large area of historic dump artifacts. Because of the tremendous amount of cultural material located in a historic dump, gradient levels of material frequency were easily recognized. Areas of high concentrations and low to non-existent deposits were noted. In short, the use of an auger survey to help delimit and test a cultural deposit such as the Quartermaster Dump was a very appropriate research methodology.

The implementation and use of *systematic* subsurface sampling techniques are generally under appreciated and relatively undeveloped in cultural resource management. Continued studies of applications of these methods will only strengthen the technique and its repeated use in the future.

Table 7.2: Frequency of glass type and color by auger block.

| Glass Type and Color | Block 1: E856-861 | Block 2: E875-884 | Block 3-5: E895-961 |
|----------------------|-------------------|-------------------|---------------------|
| Window: Clear | 0 | 1 | 12 |
| Window: Aqua | 1 | 5 | 11 |
| Lantern: Clear | 0 | 8 | 6 |
| Bottle: Brown | 1 | 20 | 53 |
| Bottle: Aqua | 3 | 6 | 22 |
| Bottle: Purple | 0 | 3 | 22 |
| Bottle: Green | 4 | 3 | 18 |
| Bottle: Clear | 2 | 6 | 17 |
| Bottle: Lavender | 0 | 1 | 2 |
| Bottle: Turquoise | 0 | 1 | 0 |
| Misc.: Clear | 1 | 6 | 36 |
| Misc.: Green | 2 | 1 | 8 |
| Misc.: Red | 0 | 1 | 0 |
| Misc.: Cobalt Blue | 0 | 1 | 0 |

CHAPTER 8

BLOCK EXCAVATION AREAS

by
Danny N. Walker

Seven block areas (Figure 3.1) were excavated at the Fort Laramie Quartermaster Dump Project area in 1994. Four of these blocks were directly along the riverbank, where the remote sensing and riverbank surveys (see earlier discussions) indicated cultural materials were present (Figure 4.9). The areas between these block areas were shown by the remote sensing to be either devoid of metal artifacts or to have a much lower density of such materials. A fifth excavation block was placed where a large metallic anomaly was recorded by the remote sensing. The sixth excavation block area was placed across a large depression on the upper terrace. The last block excavation area was placed along Backhoe Trench One, where a large quantity of bone was discovered during the backhoe trenching. Each of these block areas will be described below. Features located within the various excavation blocks are described in a later section of this report.

EXCAVATION BLOCK ONE

1994 excavations in Block One (Figures 8.1, 8.2) were around the edge of the first large scallop into the riverbank. Approximately 25 m² were excavated in this block during the 1994 investigations. This is the western-most block of the four along the riverbank. While artifacts were recovered

from all units in the block, most were recovered from the western end of the block. Remote sensing suggested this portion of the excavation block had a higher density of metallic materials than the eastern end of the block. Excavations revealed this to be the case.

A large amount of artifact material (Figure 8.3, upper), identified as being of primarily officer quarters origin, or at least from a living structure occupied by persons from a higher social class, was recovered from Excavation Block One. Most uniform buttons recovered were officer's buttons, and not general issue. Ceramics and bottles recovered from the block also were more of a "higher" class than that recovered from block areas felt to be enlisted men's trash. There were also several children's artifacts of a type suggestive of a higher quality than expected for children of enlisted men or non-commissioned officers. Most ceramic and glass artifacts were broken in place (Figure 8.3, lower), suggesting they were at least fairly intact before they were dumped onto the riverbank. Most artifacts did not appear to have been disturbed after their initial placement in the area. Besides the presence of often intact or conjoinable glass and ceramic artifacts, this lack of disturbance also can be seen in the excellent preservation of a rubberized boot (Figure 8.4, upper).

FORT LARAMIE NATIONAL HISTORIC SITE **1994 QUARTERMASTER DUMP PROJECT** **BLOCK 1 -- EXCAVATION UNITS**

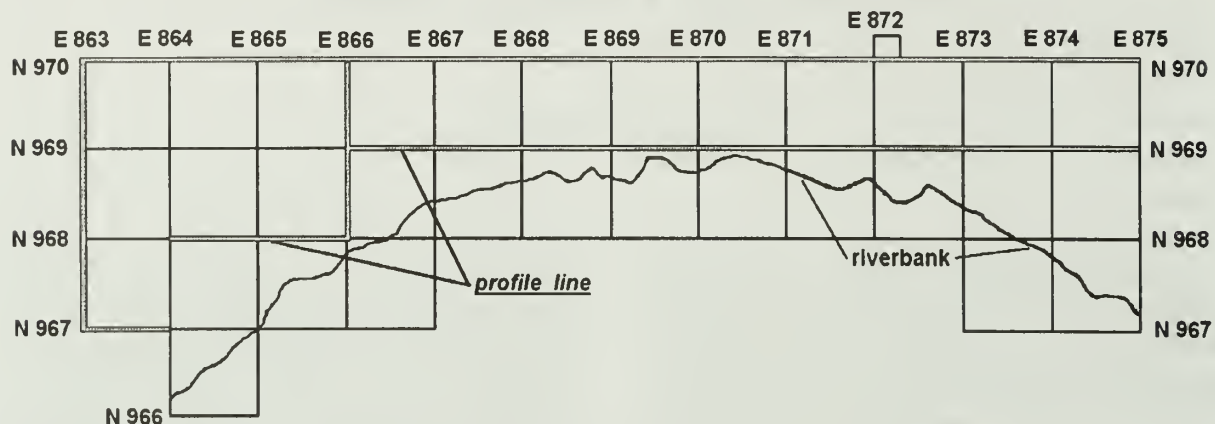


Figure 8.1: Excavation Block One unit layout and profile locations.



Figure 8.2: Overview of Excavation Block One, looking west (upstream).



Figure 8.3: Upper: View of west end of Excavation Block One, showing artifact distributions. Lower: Closeup of broken ceramic and glass artifacts from Excavation Block One.

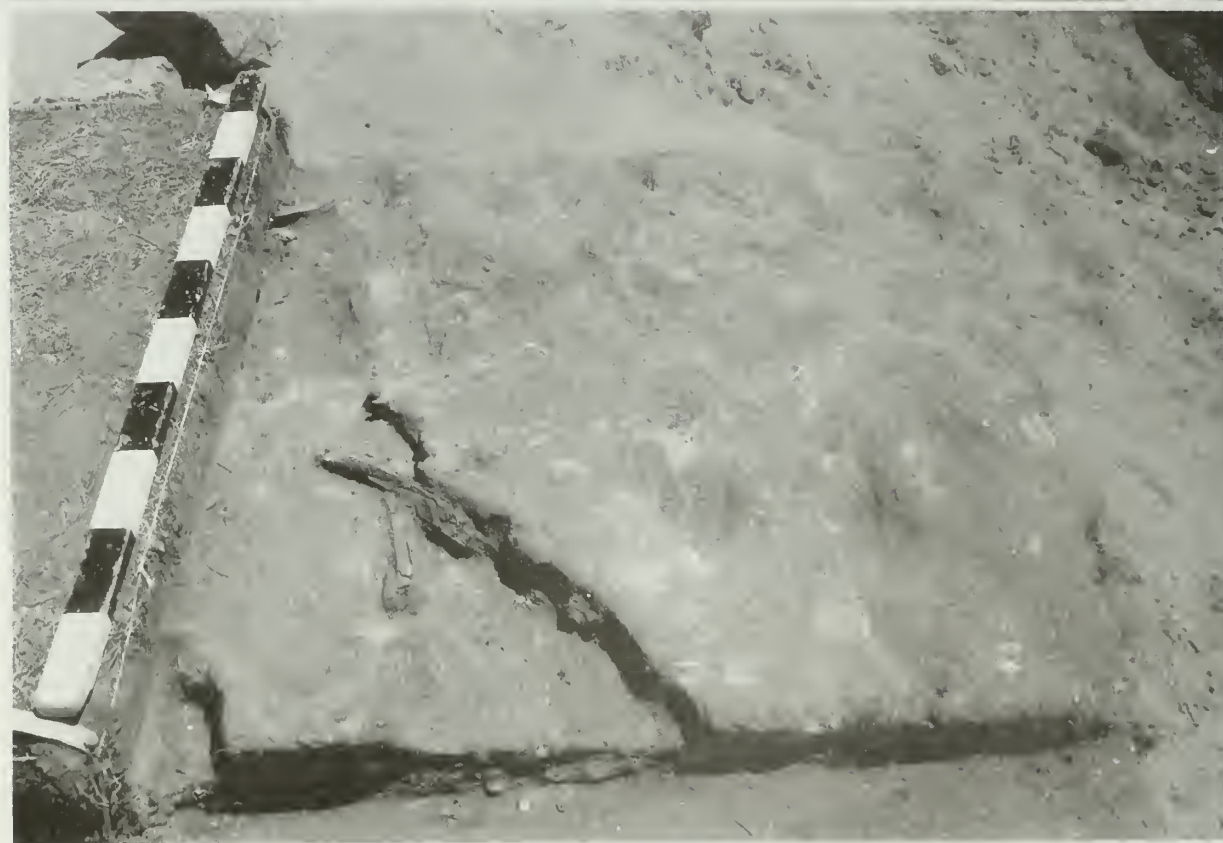


Figure 8.4: Upper: Rubberized boot recovered from Excavation block One. Lower: Excavation Block One construction material dump feature. Surface excavated onto level of lime grout.

Artifact distributions in this block suggest a minimum of four dumping episodes occurred along this edge of the riverbank (Map 1). Three of these were of general trash (Units N976-970 E863-864; N968-970 E864-866; N968-970 E870-873), while the fourth (N969-970 E865-867; Figure 8.4, lower) appeared to be primarily of construction materials (wood fragments, lime grout pieces,

brick fragments, etc.). Two of the general trash dumps were on the west end of the 1994 block while the third was toward the east end, and did not appear to be as extensive (Map 1) as the others. These dump episodes are described in greater detail below (see Feature Descriptions).

Sediments in Excavation Block One were primarily a series of sandy (Figures 8.5 and

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 1 -- NORTH WALL N 969, E 866-875

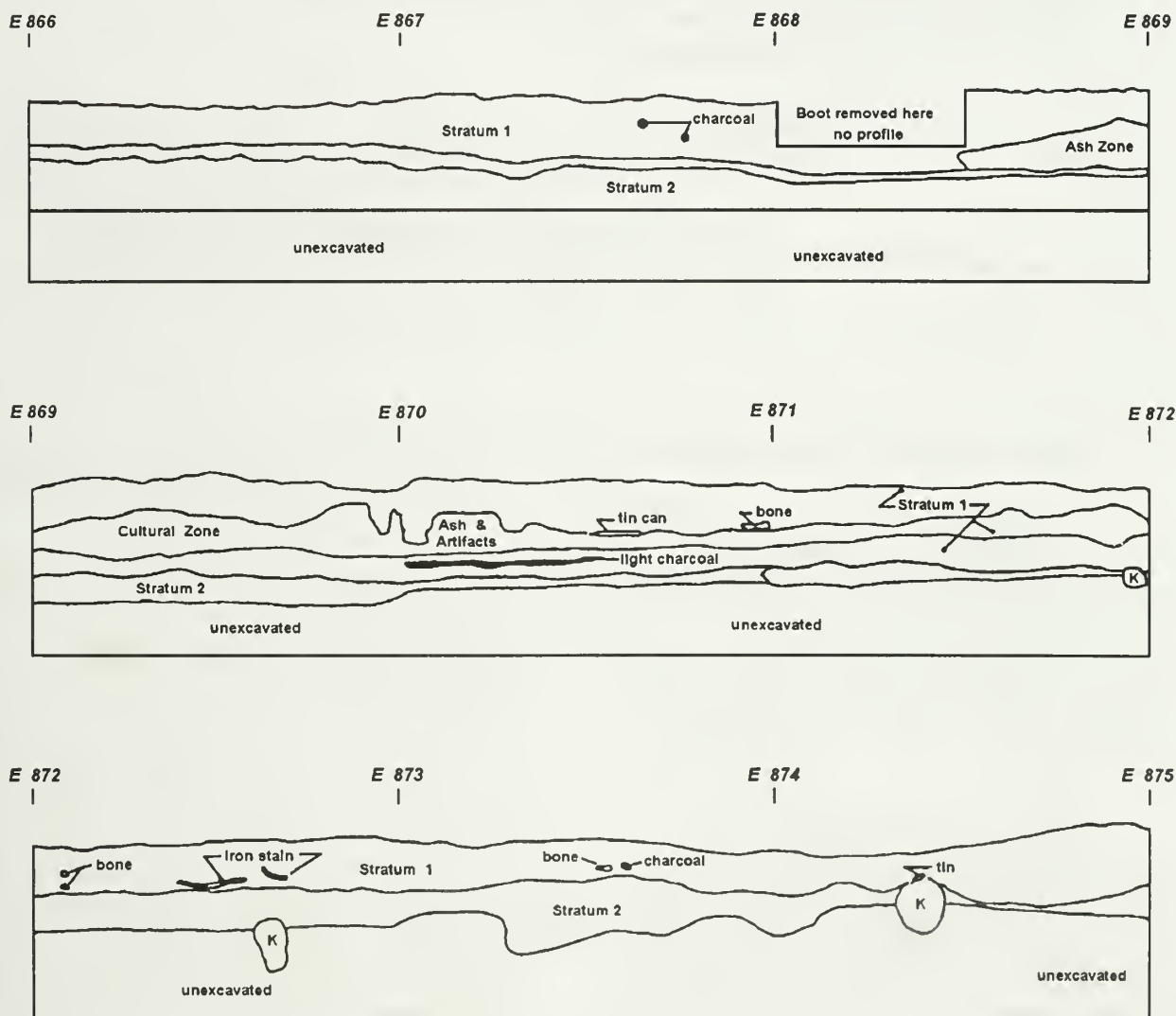


Figure 8.5: North Wall profile, N069/E866-875, Excavation Block One.

8.6) silts and silty sands with occasional gravel lenses. The main cultural level (usually found just below the modern A-horizon, often exhibited a higher degree of organics than the underlying sediments. This was primarily because of the presence of charcoal or decomposing wood. The underlying sediments also showed a higher incidence of pebbly sand than the finer-grained sediments of the cultural level. The overlying sediments and the sediments enclosing the cul-

tural zone also appeared most often to be overbank deposits, while the underlying sediments showed the appearance of typical river bed sands, similar to those noted in the extant main river channel deposits. Based on the regional geomorphology, these river sands are probably Pleistocene or early Holocene in age.

The western end of Excavation Block One showed greater detail in the stratigraphic sequence, but still basically followed the

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 1 -- NORTH WALL N 970, E 867-875

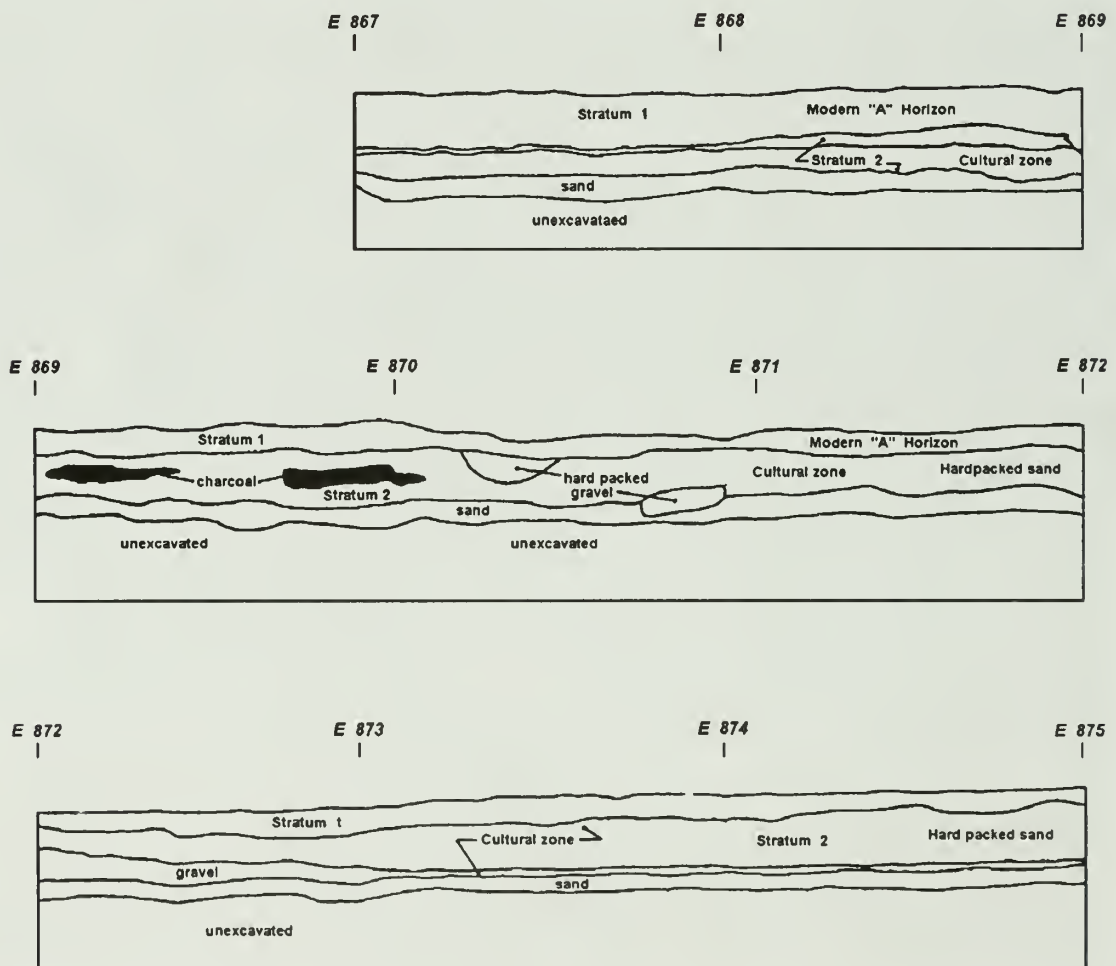


Figure 8.6: North wall profile, N970/E867-875, Excavation Block One.

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 1 -- WAGONYARD FENCE PROFILES

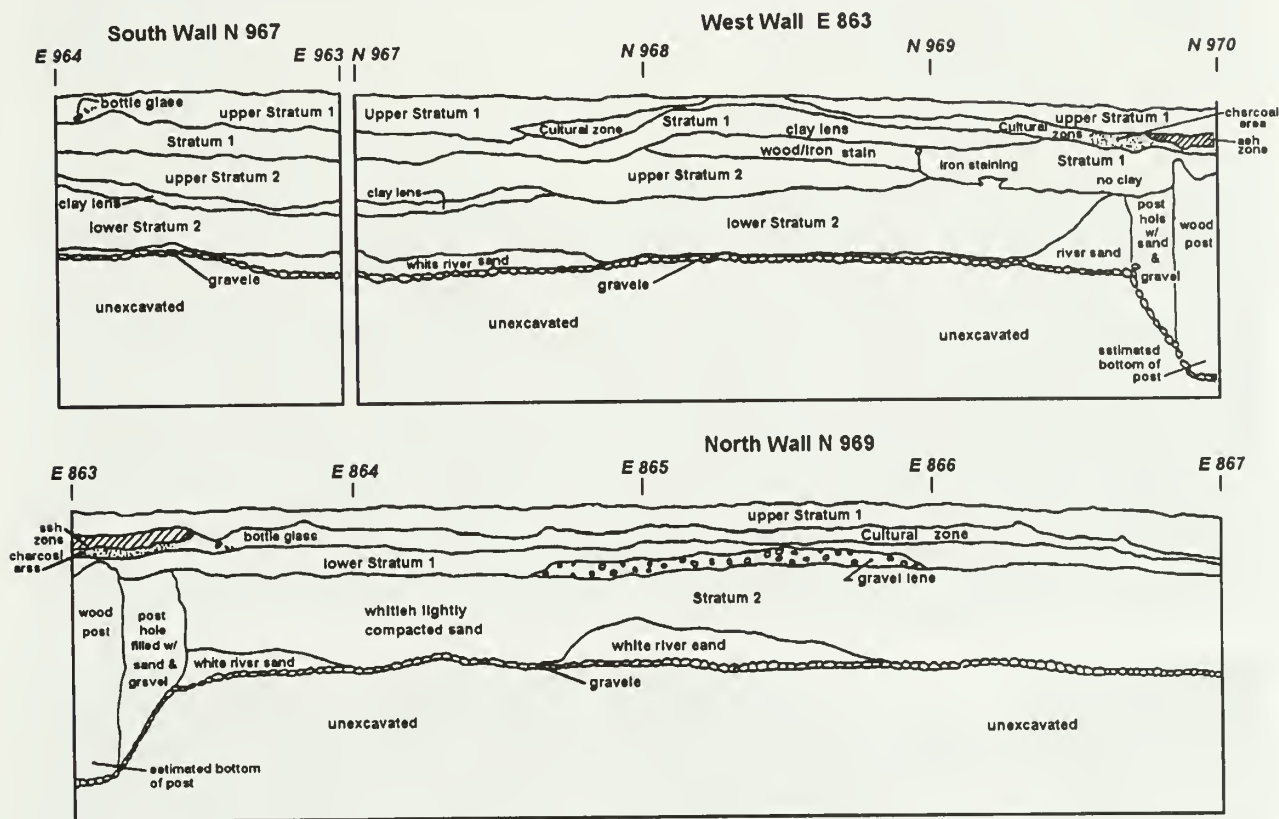


Figure 8.7: South, West and North wall profiles, west end of Excavation Block One, showing greater stratigraphic detail around base of wood wagon yard fence.

same cultural depositional sequence (Figure 8.7). This greater detail is directly attributable to the remnants of the wood wagon yard fence located in this portion of the excavation block (see description of this feature in Feature Descriptions section below). Most of the additional sedimentary layers occurred below the cultural (dump) level and above the Pleistocene river sands. This is highly suggestive that the base of the wood wagon yard fence and its associated fence posts served as a sedimentary trap when the fence structure was intact. After the fence either collapsed or was physically removed by the

military in the late 1880s, the cultural material was dumped on top of the remnants of the fence. Artifacts within this dump episode then continued to act as sediment traps until the military age artifacts were completely covered.

EXCAVATION BLOCK TWO

Excavation Block Two was placed just downstream from Excavation Block One (Figure 3.1). Approximately 21 m² were excavated in this block in 1994 (Figure 8.8, 8.9). Only a single dump episode can be postulated for this excavation block (Map

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 2 -- EXCAVATION UNITS

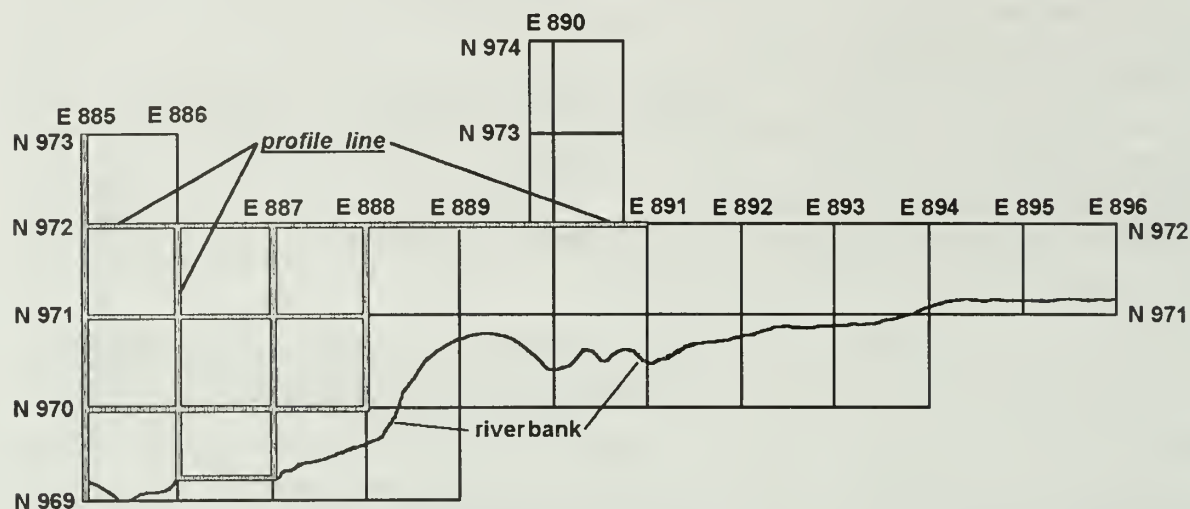


Figure 8.8: Excavation Block Two unit layout and profile locations.



Figure 8.9: Overview of Excavation Block Two, looking east, during early stages of excavation.



Figure 8.10: Artifact distributions in Excavation Block Two, looking south to riverbank. Note more dispersed nature compared to artifacts from Excavation Block One.

2), with most of the material highly dispersed and no real concentration of materials similar to the dump episodes in Excavation Block One (see Map 1). The artifacts do not appear to have been moved after initial burial (Figure 8.10), but probably were dispersed during an undetermined period of time after placement on the riverbank. This is in contrast to the artifacts in Excavation Block One, where it appears fairly rapid deposition covered the dump materials. The difference in dispersal between the two block areas may be related to the lack of the large amounts of wood (i.e., fence remnants or construction supply remnants) that served as the initial sediment trap in Excavation Block One. Artifacts in Excavation Block Two probably did serve as the initial sediment traps for the enclosing overbank deposits. However, because of their dispersed nature, they were

not as efficient as those in Excavation Block One.

Again, most artifacts recovered suggest a "higher" class of living than expected for enlisted men at the fort. While no "children's" or "women's" artifacts similar to those in Excavation Block One were recovered in this excavation block, fine household goods, such as a brass clock pendulum and brass key, along with officer's uniform buttons, suggest this dump material was also related to an officer's quarters.

Cultural sediments were also shallower in Excavation Block Two than those in the western portion of Excavation Block One, but at a similar depth below the surface to the eastern portion of that block (Figures 8.11, 8.12). The stratigraphic sequence was also similar in that the artifacts were found in a silty sand level just below the modern A-

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1994 QUARTERMASTER DUMP PROJECT
BLOCK 2 - NORTH WALL PROFILES

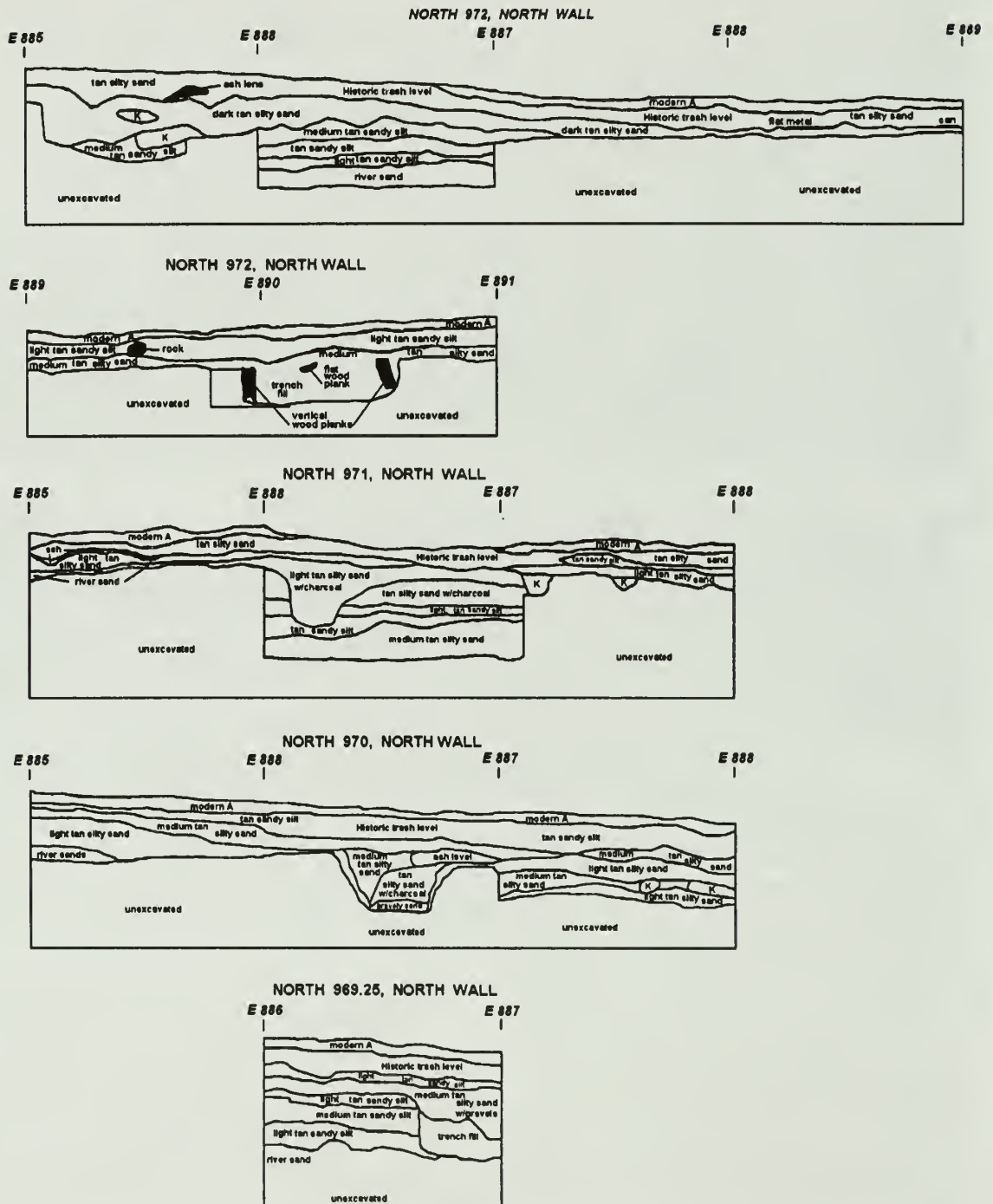


Figure 8.11: North wall profiles, N969-972, E885-889, showing cultural levels and pre-dump ditches.

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 2 -- WEST WALL PROFILES

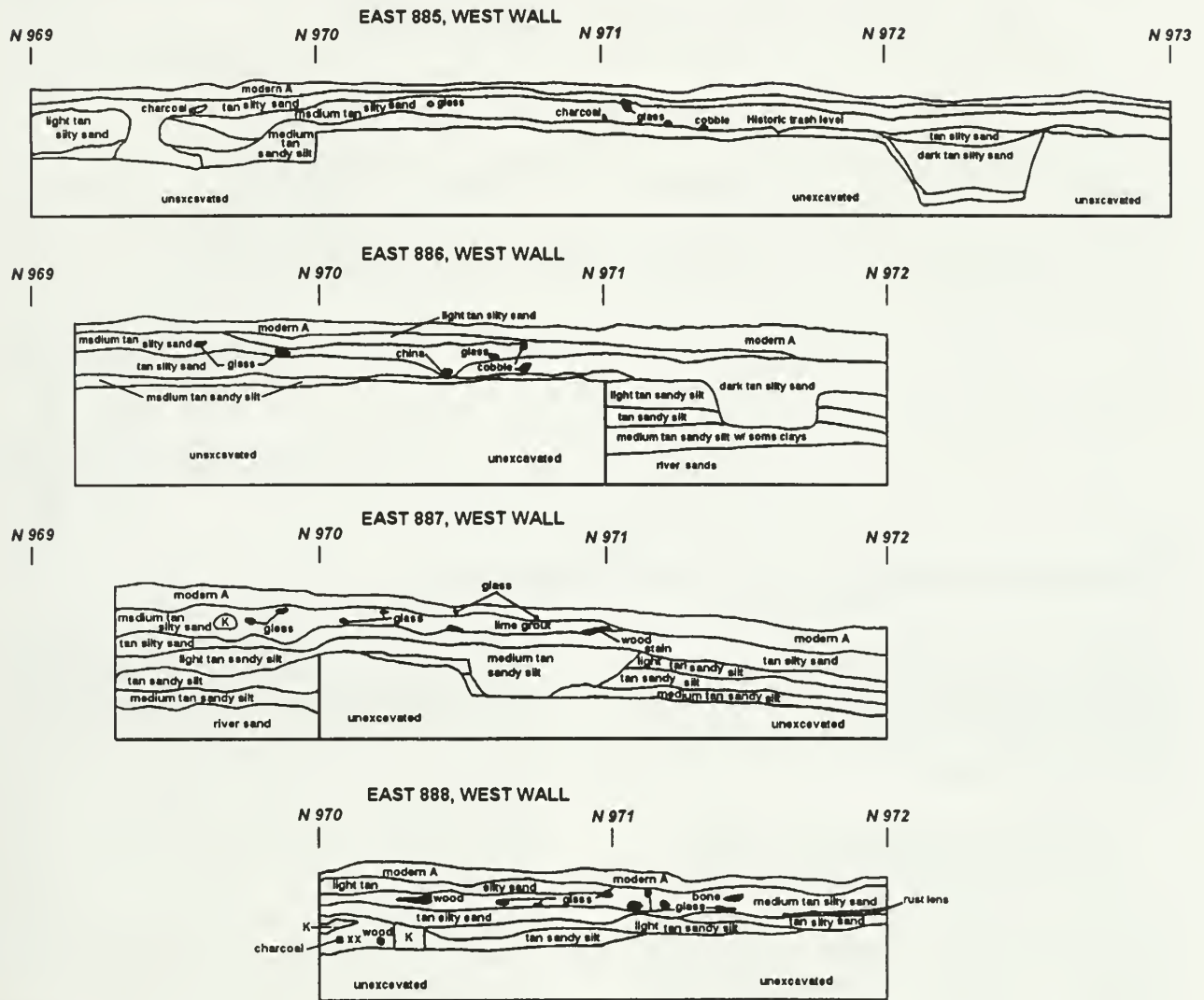


Figure 8.12: West wall profiles, Excavation Block Two, E885-888, N969-973, showing cultural level and pre-dump ditches.

horizon, with a sequence of sandy silts and silty sands lying below the cultural materials. This in turn overlaid the Pleistocene river sands forming the base of this terrace.

A series of pre-dump ditches were recorded from this excavation block (see Feature Descriptions below). Fill within these

ditches showed a series of events involved with their in-filling (Figures 8.11, 8.12). The bottom of the ditches was often excavated through the sequence of silty sand/sandy silts, ending within the Pleistocene river sands. This suggests the ditches were probably not used as in-flow ditches, but rather

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 3 -- EXCAVATION UNITS

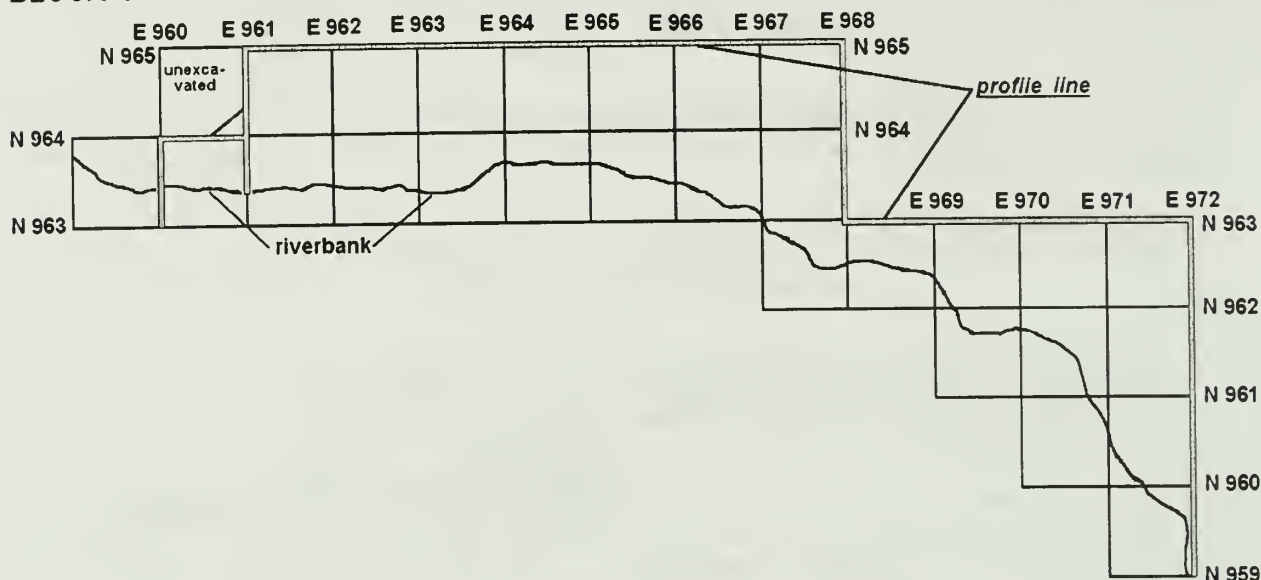


Figure 8.13: Excavation Block Three unit layout and profile locations.

drainage. There also was no organic material preserved in the bottom of the ditches such as would be present if water had ever stood in the ditches.

EXCAVATION BLOCK THREE

Excavation Block Three was placed on the next large scale remote sensing anomaly downstream from Excavation Block Two (Figures 3.1, 4.9). No large amounts of metallic materials were revealed by the magnetometer survey between the areas encompassing Excavation Blocks Two and Three (see Somers, this report). Similarly, the auger probe survey showed while artifacts were present, there were no large concentrations between these two excavation blocks. Nineteen m² were excavated in this block (Figure 8.13), following the edge of the riverbank.

Diagnostic artifacts recovered from this

excavation area are highly suggestive of being either enlisted men's barracks, construction materials, or post sutler's store in origin, or a combination of both. Most of the artifacts (by volume/weight) were broken spirits bottles, usually beer or wine. No artifacts diagnostic of officer's, or officer's families, materials, were found. There was also a large amount of faunal materials recovered from this excavation block (Map 3).

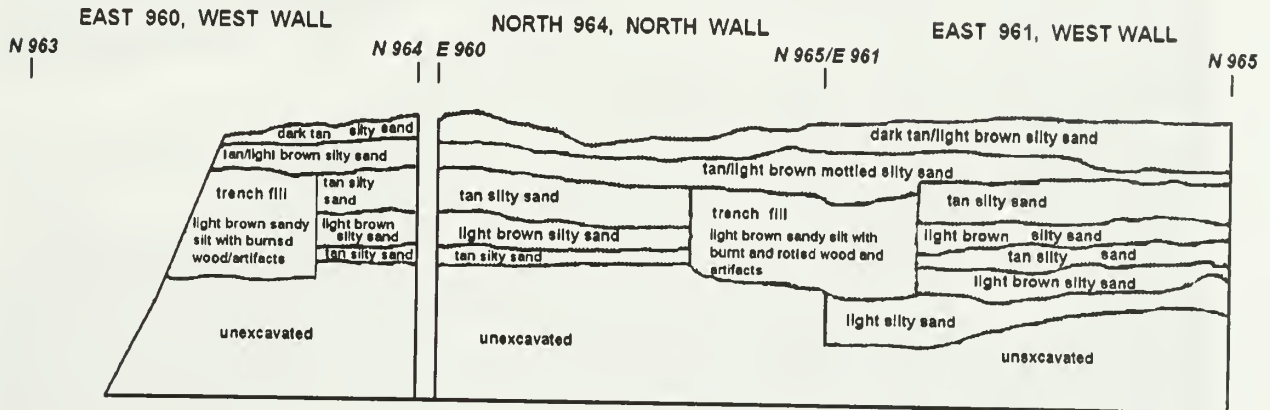
At least four different dump episodes (Map 3) can be postulated in this excavation block based on artifact distributions. Two are construction materials dumps (N964-965 E965-967 and N963-965 E965-968), cleanup from the post sutler's area (N963-965 E965-968), and a large bone scatter (N961-965 E965-972). These dump episodes are described in greater detail below (see Chapter 9, Feature Descriptions, below).

Cultural sediments in the eastern portion

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 3 -- WEST END PROFILES



BLOCK 3 -- NORTH WALL PROFILES

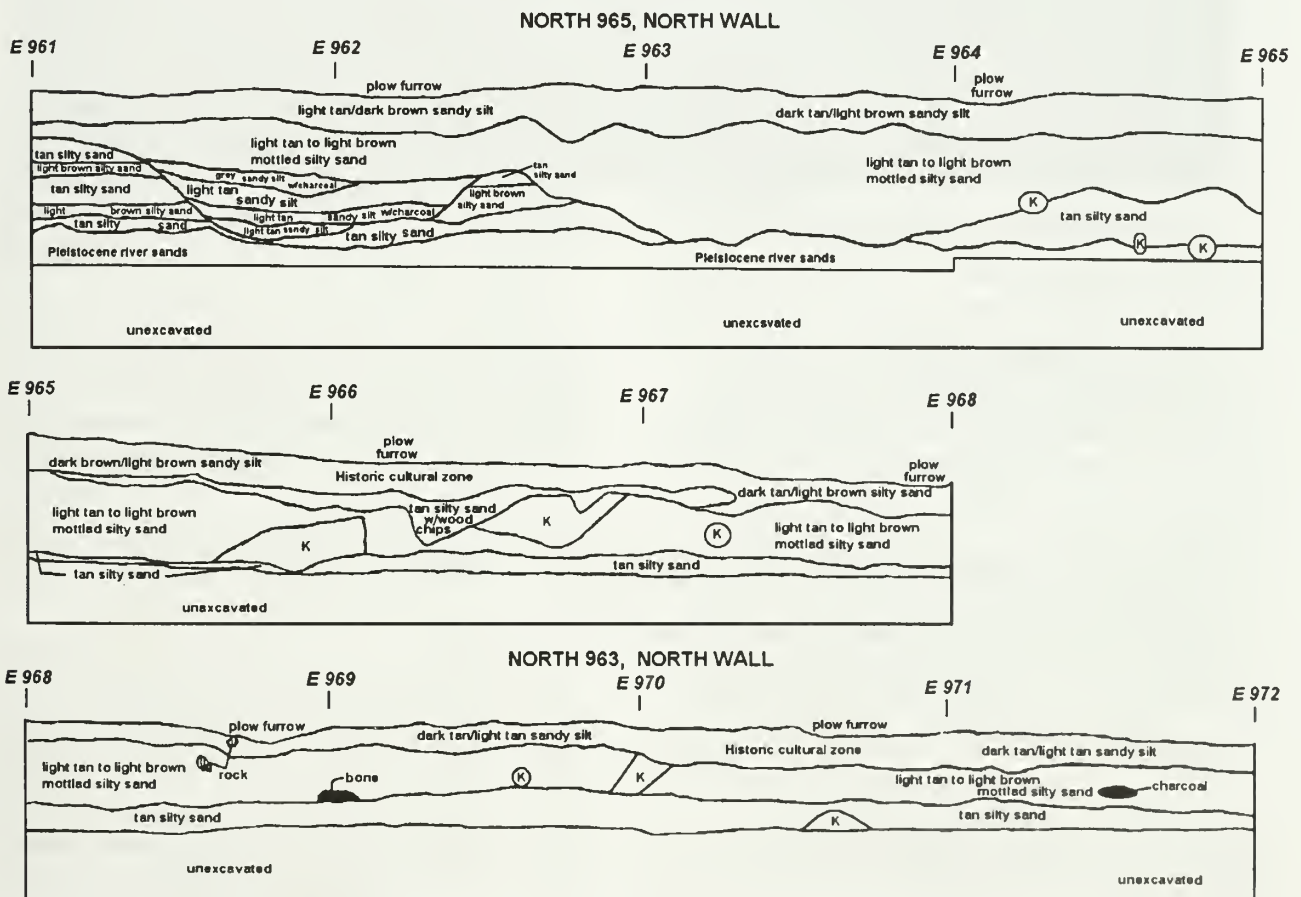


Figure 8.14: Upper: West end profiles, Excavation Block three. Lower, North Wall profiles, Excavation Block Three, N965 and N963.

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 3 -- EAST WALL PROFILES

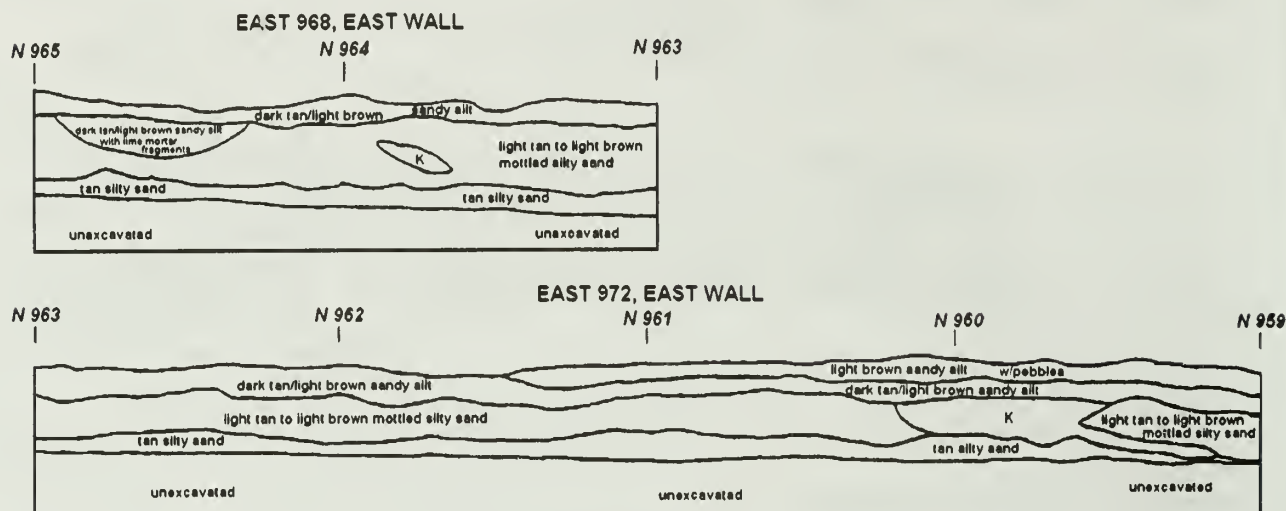


Figure 8.15: East wall profiles, Excavation Block Three, East 968, E 972.

of Excavation Block Three were similar to those found in Excavation Blocks One and Two (Figure 8.14 lower, 8.15), that is a series of silty sand and sandy silts with occasional gravel lenses. An area between E965.5 and E968 was, however, disturbed by various krotovina activities, disrupting the normal simple stratification of these levels.

The west end of the excavation block, however, was not typical of the rest of the

excavation blocks at the Quartermaster Dump Project. Here, a thicker stratigraphic sequence of additional silty sand levels were deposited, truncated by two events. The earliest of these was a natural cut and fill sequence (Figure 8.14, lower; E961-963), cutting through the original sequence of sediments. This gully episode probably began filling during the early military occupation at the fort. A lead pistol ball, dating to a 1850s

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 4 -- EXCAVATION UNITS

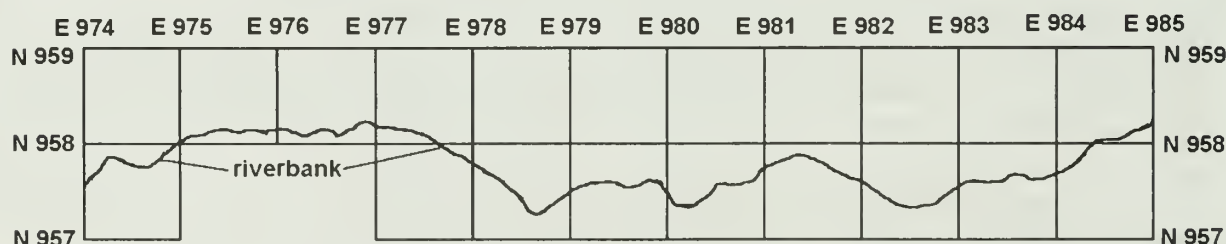


Figure 8.16: Excavation Block Four unit layout and profile locations.



Figure 8.17: Excavation Block Four, looking upstream (west). Note artifacts lying on Pleistocene river channel cobble layer.

variety, was found at the bottom of the gully cut, just below the first fill stratum. Within this gully fill sequence was found one of the construction material dump features from this excavation block. This was the only burned feature located during the 1994 excavations (see Feature Descriptions, below).

This burned construction material was probably associated with the second feature found in this part of Excavation Block Three. This is the trench feature, shown in the profile (Figure 8.14 upper), filled with a large wooden plank and other burned metal artifacts described in detail elsewhere (see Feature Descriptions, below).

EXCAVATION BLOCK FOUR

The west end of Excavation Block Four was located only two meters east of Excavation Block Three (Figures 3.1, 4.9). The remote sensing indicated a high magnetic anomaly in this area. At the same time, the riverbank survey (LaBelle, this report) showed a large number of tin cans and other metal artifacts were eroding from the riverbank at this portion of the project area. Fifteen m² of area (Figure 8.16) were excavated in Excavation Block Four.

The stratigraphic sequence here differed from the other block excavation areas in that the cultural materials lay on a Late Pleistocene river cobble channel (Figure 8.17), instead of the Late Pleistocene overbank

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 5 -- EXCAVATION UNITS

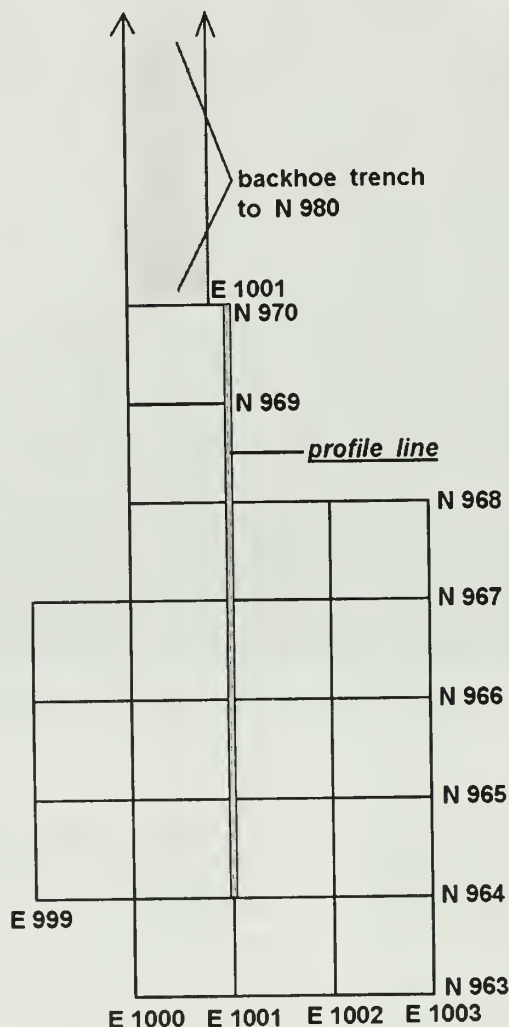


Figure 8.18: Excavation Block Five unit layout and profile locations.

deposits found in other regions of the project area. Because of the channel cobbles, this portion of the project area appears more stable, following the collapse of the river bank to its natural repose angle. The cultural stratigraphy, however, was again composed of a sequence of overlying silty sands and sandy silts, of various hues and colors.

The stratum containing the cultural mate-

rials showed a higher degree of organics because of the decomposing organic materials included within the dump episode.

Artifact materials began on the ground surface in Excavation Block Four, was about 20-30 cm thick in its greatest part, and, as said above, terminated on the surface of the Late Pleistocene cobble surface. Most artifacts recovered from this excavation block

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 5 -- E 1001, WEST WALL PROFILE

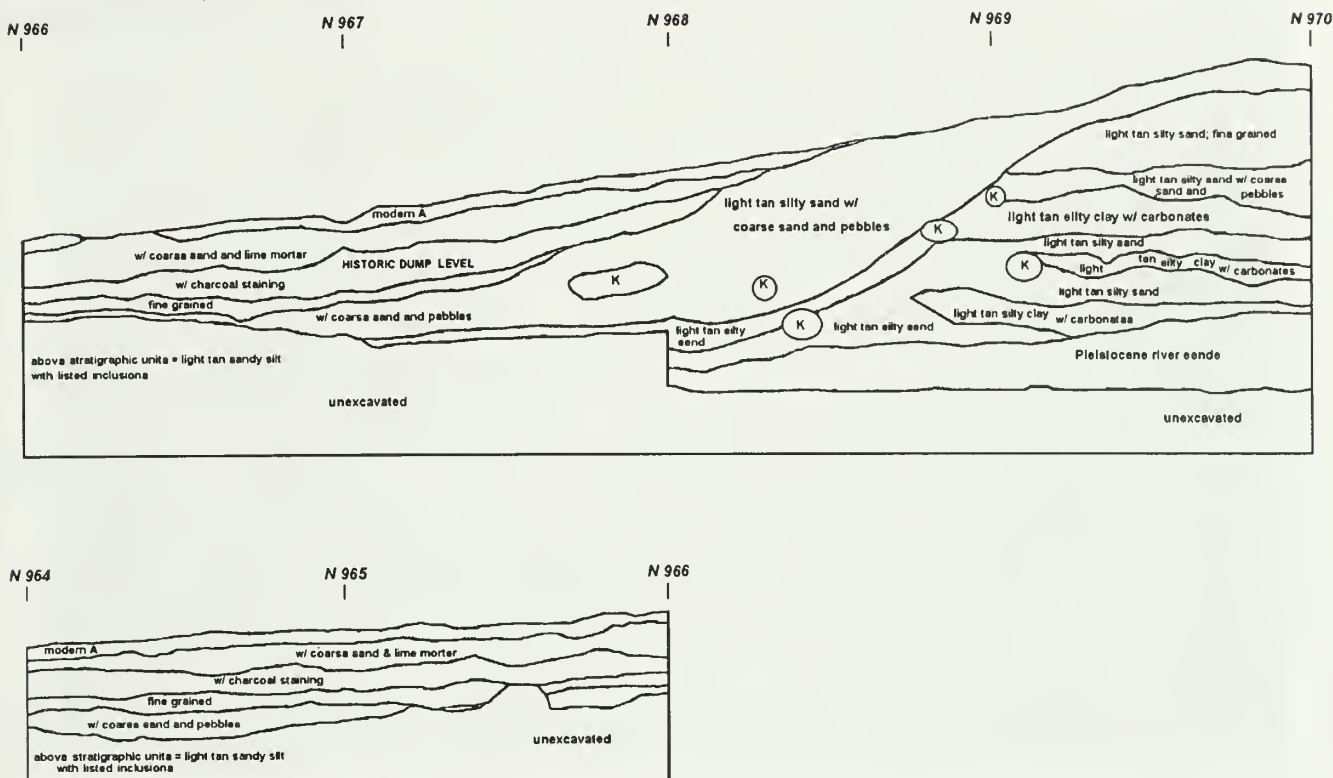


Figure 8.19: Stratigraphic profile through the center of Excavation Block Five, showing stratigraphic relationships between dump materials, lower terrace sediments and upper terrace sediments.

were metal, primarily tin cans.

Four different dump episodes can be distinguished by the artifact distributions within Excavation Block Four (Map 4). All four, based on recovered artifacts, can be identified as non-officer in origin (see Feature Descriptions, below), and are composed of general trash materials only.

EXCAVATION BLOCK FIVE

Excavation Block Five (Figure 8.18) was placed away from the riverbank (Figure 3.1), where the remote sensing revealed a high concentration of metallic objects (Figure 4.9). No artifacts were present on the ground surface of this excavation block; the artifacts were visible only through the remote sensing

study. Twenty m² were excavated in Excavation Block Five (Figure 8.18).

This series of three dump features (Map 5) was placed over the bank of the upper terrace surface in this part of the project area (Figure 8.19). While most artifacts recovered from the three episodes of dumping were probably military in origin, at least some of the material from two of the episodes was post-military in age (see Feature Descriptions, below). One bottle showed a manufacturing technique not available until after 1890, the last year of military occupation at Fort Laramie. The origin of the third dump episode could not be determined.

These three dump episodes overlapped (Map 5), and generally could not be separat-



Figure 8.20: Overview of Excavation Block Five, showing artifact distributions and discredetness of dump episodes.

ed in the field (Figure 8.20). Only after the plan view map of this excavation block was prepared, could these three dump episodes be separated. Artifact distributions also showed how these dump episodes were not disturbed and scattered after their original deposition in this part of the project area. Once the edges of these dumps were reached, artifact material did not "thin" out; it distinctly ended. This material was recovered in the original positions where it was deposited.

Stratigraphically, the material from Excavation Block Five was dumped over the edge of the upper river terrace onto a lower terrace surface in this part of the project area. This upper terrace is the same terrace surface where artifact materials from the other exca-

vation blocks was deposited. Once deposited, flood overbank deposits must have quickly covered the dump feature, preserving it in situ, with little or no movement of artifacts. This series of fill sediments can be readily seen in the cross profile through the excavation block (Figure 8.19).

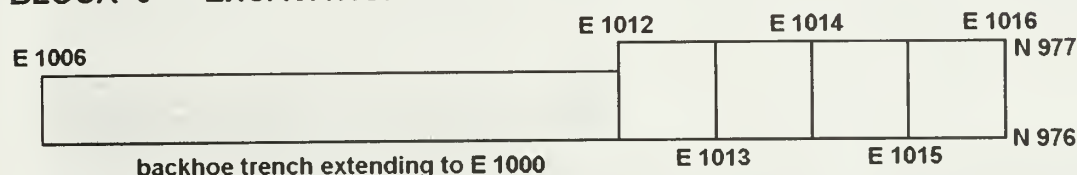
EXCAVATION BLOCK SIX

Only four m² were excavated in Excavation Block Six (Figure 8.21). This excavation block was placed over a depression on the upper terrace, northwest of, and above, Excavation Block Five (Figure 3.1). Originally, it was thought this depression might be remnants of a human constructed feature, but excavations revealed it was a natural channel

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BLOCK 6 -- EXCAVATION UNITS



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BLOCK 6

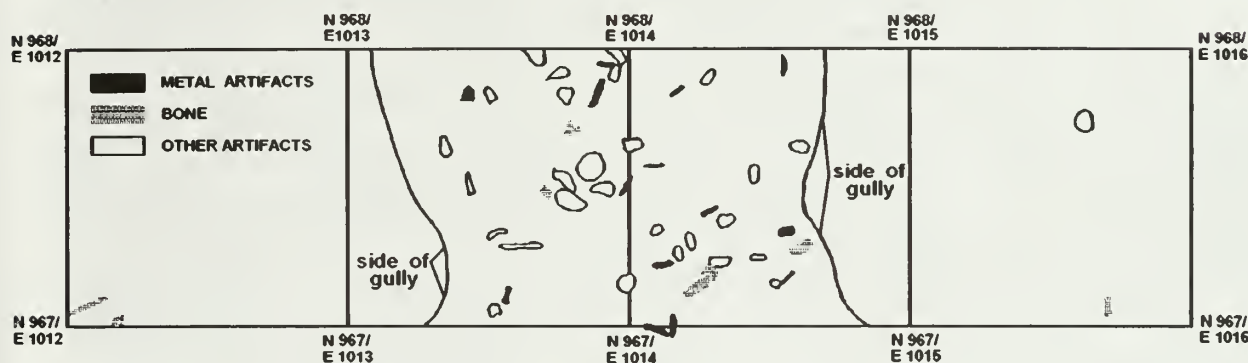


Figure 8.21: Upper: Excavation Block Six unit layout. Lower: Excavation plan map of excavation Block Six, showing distributions of artifacts restricted to channel limits.

feature filled with a series of high organic sediments. This channel fill would be similar to that recorded in Excavation Block Four, although in this instance, the fill was quicker and did not involve as many filling episodes.

The remote sensing project did not indicate any anomalies in this part of the project area, neither with the magnetometer or the soil resistivity. It is highly probable this lack was because masking by nearby anomalies prevented their observance on the remote sensing maps (Figure 4.9)

Artifacts recovered from the block excavation area were primarily restricted to the limits of the channel cut (Figure 8.22). There was no discrete concentrations of

artifacts recovered from this excavation block. Rather, mapped artifacts shown (Figure 8.21, lower) were recovered from throughout a 50-60 cm thick stratigraphic level comprising the channel fill of this feature. Preliminary analysis of the artifacts also provided no data on a potential source for these artifacts, that is, it could not be determined whether they were from officer, enlisted men, post sutler, or other source.

EXCAVATION BLOCK SEVEN

During excavation of Backhoe Trench One (see McFaul et al., this report), a quantity of sheep and pig bones was discovered. The southern portion of Excavation Block Seven (Figure 8.23) was established over this



Figure 8.22: South wall, Excavation Block Six, showing profile of natural channel and fill.

area to examine the origin of the faunal remains. This was eventually expanded to a six m² block. It was determined the backhoe trench went through the central portion of this bone feature, but a wide distribution of bone was still preserved and excavated (Map 6).

Most artifact material recovered from this southern portion of Excavation Block Seven was bone. Most metal artifacts were associated with construction of the wood structure feature described elsewhere (see Feature Descriptions, below). Few ceramic or glass artifacts were found in this part of Excavation Block Seven.

Sediments in this portion of Excavation Block Seven were similar to those recorded for the eastern end of Excavation Block One,

found immediately south of Excavation Block Seven. That is, a sequence of alternating sandy silts and silty sands. The stratum containing the cultural materials appeared to also contain a higher degree of organics, probably resulting from decomposition of the organics associated with the faunal materials when first deposited. If the recorded structure were a stable remnant or other livestock containment structure, the higher organics could also be associated with that activity.

Four m² were excavated in the northern portion of Excavation Block Seven, where a large concrete block was found during excavation of Backhoe Trench One (Figure 8.23). Few artifacts were found in this portion of the excavation block, except those directly associated with the concrete feature (see

Feature Descriptions, below).

Sediments in this northern portion of Excavation Block Seven were distinctly different from those in the southern portion of the excavation block. Here, the sediments were a series of gray and greenish clays. Some of these clays resulted from in-filling of the irrigation ditch running through this portion of the excavation block. Other clays on the lower and outer (north and south) portion of the sedimentary sequence in this area originated from construction of the irrigation ditch itself.

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1994 QUARTERMASTER DUMP PROJECT

BLOCK 7 -- EXCAVATION UNITS

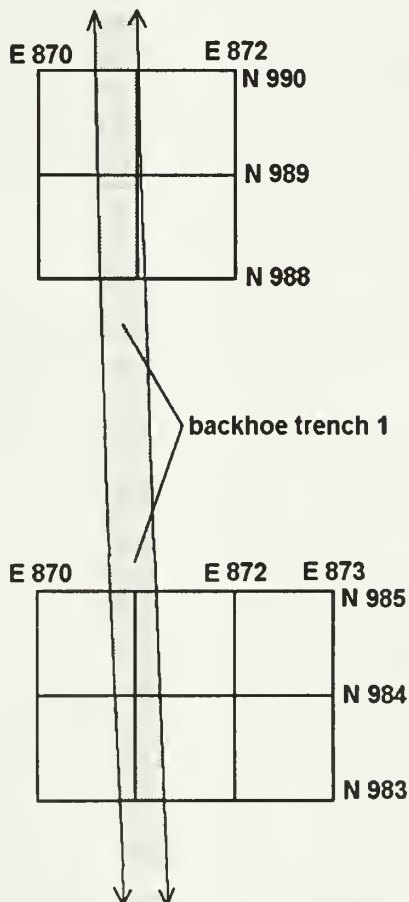


Figure 8.23: Excavation Block Seven unit layout.

CHAPTER 9

FEATURE DESCRIPTIONS

by
Danny N. Walker

As with any archeological excavations, several features were recorded during the 1994 excavations at the Fort Laramie Quartermaster Dump. These features were both military and civilian in origin. Wood structures (two, possibly three), military ditches (three), civilian "farming" activities (one), civilian irrigation ditches with an associated headgate (one), and one burned area were among the features recorded to be discussed here. If each individual dump episode (see below) is considered a separate feature, at least 17 additional features could be added to this list.

THE 1960S PLOW ZONE

As discussed earlier (see Introduction, this report), another feature in the proposed project area that should be recordable is a "plow zone." The area of the Quartermaster Dump was partially plowed by the last civilian owner of the project area. This was to allow people ("friends") to collect bottles before the property was taken over by the National Park Service.

Throughout the excavations in 1994, wall profiles and stratigraphy were constantly examined in attempts to find out if this plow zone could be detected and confirmed. As distinctive as plow zones can be, no evidence could be found in the excavations. All artifacts appeared to be in situ, with no

post-depositional disturbance. There also did not appear to have been any disturbance of the stratigraphy. It was almost appearing the plowing incident was another part of the local folklore about Fort Laramie.

However, in late July the plow zone was located, but not as a direct result of the excavations. By that time, the vegetation over the terrace had begun to dry out, and a walking path had developed across the project area. Early one morning, just at sunrise, crew members were walking across the terrace and noticed a series of ridges running approximately perpendicular to the river (Figure 9.1). These were immediately identified as eroded plow furrows, and the plow zone area had been located by their discovery.

These furrows were spaced between five and six feet apart and extended to the river bank near Excavation Block Three. They did not occur as far west as Block Two, and because of the terrace edge, did not extend to the river near Block Four. They also did not appear to extend as far east as Block Six. Some furrows extended approximately 40-60 m from the riverbank. Once these furrows were identified, the backwall profiles were again examined in Block Three. These furrows also showed up on these backwalls (Map 3), but not with a distinctive plow zone, only as a surface depression. Close



Figure 9.1: Top: View looking east across project area in early morning. Bottom: Aerial view across project area. Series of ridges are remnants of old plow furrows from early 1960s.

examination of the stratigraphy also suggested the plowing had not been deep, and probably just below the depth of the extant furrows. This is supported by the large area of intact rotted wood recorded in Block Three between E965-E968 around 20-30 cm deep. The spacing and depth of the furrows also showed the plowing was not as extensive as Mattes' statement (Introduction, this report) suggested. The recollections of long-time park employee Charles Potter were correct in that the plow furrows were not next to each other (continuous) or completely covering the area, but separated by several feet (Charles Potter, personal communication, 1994).

Aerial photographs taken of the project area in 1993 were then reexamined. The distinctive pattern of these plow furrows was readily apparent in this photograph (Figure 9.1). This also showed the extent of the plowing was more than what appeared on the ground surface. The plowing extends for some distance east of Block Six. This area of the project area is covered with high grass and other dense vegetation. Ground surface is hard to see, thus obscuring the physical appearance of the furrows in this area.

Based on these lines of evidence, while the Quartermaster Dump Project Area has been disturbed by this illicit plowing in the early 1960s, there are intact dump deposits lying between and below the plow furrows that were never disturbed. This allows spatial analyses on Block Three artifact distributions to be valid.

PRE-QUARTERMASTER DUMP EUROAMERICAN DITCHES

During 1994 excavations at the Quartermaster Dump, two non-dump features were recorded in Excavation Block Two and one

in Excavation Block Three. These three features were some type of ditch predating the dump itself, i.e., these occurred stratigraphically below the main dump level. Archeologically, no evidence could be found suggesting their use and function. Similarly, no mention of such ditches have been found in the known military records at the Fort Laramie National Historic Site archives. Based on recovered artifacts, these ditches are related to the military occupation at Fort Laramie and not a civilian or prehistoric Native American occupation.

EXCAVATION BLOCK TWO DITCHES

Two sets of ditches were recorded in Excavation Block Two; a "Y" shaped ditch and a wood-lined ditch (Figure 9.2). The relationship between these two features is unknown. They are presently separated by a distance of around four meters. If their riverbank ends are linearly extended, they could have connected around three or four meters beyond the present riverbank. However, no evidence is present and such a connection is speculative.

Wood-lined ditch

This ditch lies between E889 and E891 and is a known 3.5 m in length, extending from N970.5 (the riverbank) to at least N974 (Figures 9.3, 9.4). Excavations ceased at N974, with data suggesting the ditch continuing at least into the next meter. Time did not allow continuation of the excavations north to find the end of the ditch.

Total length of this wood-lined ditch feature from the riverbank is unknown. The ditch itself is between 20 and 35 cm in width for most of its length (see profile in Figure 8.11). This does not include the width of the wood planks, some of which appear originally to have been between 4.5-5.5 cm (about two inches) in thickness. Because of erosion and rotting, much of the plank is

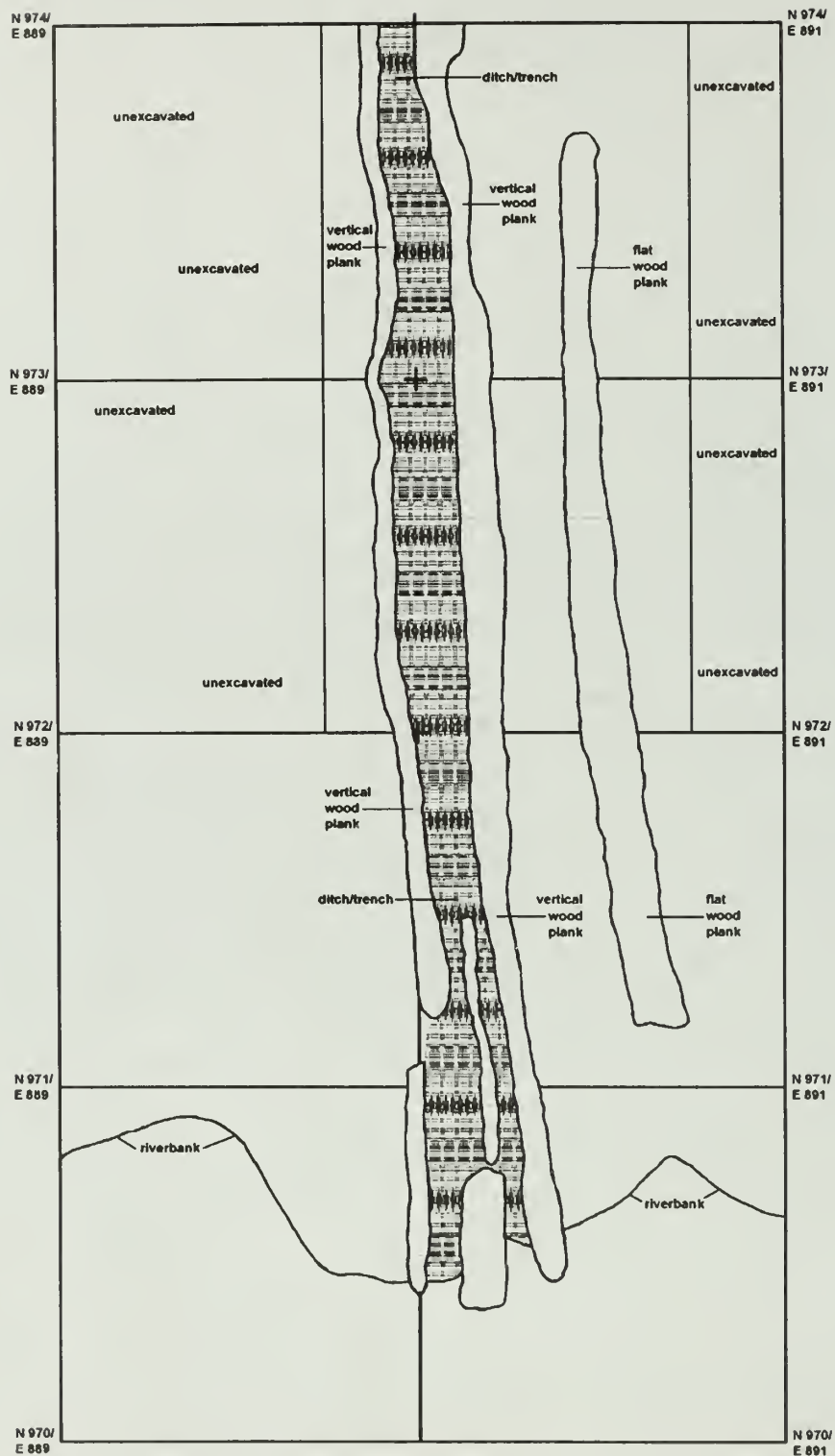


Figure 9.2: Plan view of wood-lined ditch, Excavation Block Two. Note position of wood planks along sides of ditch; also third plank lying on flat surface east of ditch.



Figure 9.3: View of Excavation Block Two, looking east, after excavation of dump artifact material and delineation of ditches, showing spatial relationships between the two ditches.

now 2.0-3.0 cm (about one inch) thick. Most of the rest of the planks appear to have been originally one inch stock. Some of these planks have rotted down to less one cm (half inch) thick. There are cut nails up to four inches long nailed into the wood planks. There are no boards lying on the

floor of the trench, only the two parallel planks along the walls. The south end of the feature was excavated from both the outside and the inside. It appears the outside of the boards were placed right against the fine-grained light tan, compacted sand that is appearing in all units to be below the historic



Figure 9.4: View of wood-lined ditch feature (looking south), with river in background. Two vertical planks on left outline ditch; flat-lying board lying on old ground surface to right.

dump level. This suggests the two side boards were laid in the trench to protect the sidewalls. If there had been a bottom board, it had completely rotted away, but then the bottom of the two side walls also would have rotted away.

The portion of the feature excavated

suggested the average depth of the trench was originally around 20 cm deep (around eight inches). Fill within the ditch feature was a medium tan silty sand (Figure 8.11), similar to that covering the original ground surface associated with the feature. The interior of the ditch was excavated in the

south 1.5 m, but only the top edges of the planks were exposed in the north two meters. While many artifacts were recovered from around the south 1.5 m of the feature (Map 2, Figure 8.11), no artifacts were mapped and few recovered in the north 2.0 m of the excavated feature.

Unlined ditch

The second ditch feature recorded in Block Two was unlined (Figure 9.2), but otherwise the same basic shape and size in cross-section appearance (Figures 8.11 and 8.12). This feature was also more extensive than the wood-lined ditch, in that a larger area was excavated and it was in the shape of a "Y." The excavated main arm of this trench was around four meters long, with the side arm around two meters (Figure 9.5). Like the wood-lined ditch, this ditch was originally excavated into the light tan, fine silty sand which forms the pre-Euro-american terrace surface. The trench itself is primarily filled with a medium tan, silty sand, with many charcoal inclusions and small pebble/gravels throughout. This can be seen in a detail of the profile (Figure 9.6), where the contact between the light tan and medium tan sediments is visible above the photo scale. The darker coloration of the ditch fill can be attributed primarily to charcoal being present in the fill and not the underlying terrace deposits. Some portions of the fill were almost entirely composed of charcoal pieces, most of which appeared to be pine (*Pinus* sp.). Occasionally, an area of grey wood ash would be noted in the fill, mixed with the charcoal. In the upper portion of the fill (top one to two cm), many artifacts were recovered, but deeper in the fill, few, if any, were recovered. This suggests the ditch was filled before deposition of the historic artifacts on the terrace surface.

As excavated, the floor of this ditch was almost flat, both side to side and from west to east. The bottom of the west end had an elevation of 99.68 cm, while the east end of the main arm had a bottom elevation of 99.69 cm. The south end of the other fork had a bottom elevation of 99.66 cm. Based on these elevations, suggestions are the ditch flowed from northwest to southeast. This is in accord with the overall pre-ditch ground surface (Figure 9.7), where the elevation difference between the two ends was between ten and twelve cm.

The southeast ends of this ditch complex cannot be determined because of riverbank erosion. The northwest end, before the junction of the two forks, continues in a northwest direction. Based on the present data, the ditch probably will continue in that direction for some distance. Its origin remains unknown; likewise presence of any other forks is unknown. Excavation Block One was only ten meters west of the last excavated portion of this ditch. No evidence of any ditches appears in that block area, although the ditch is headed northwesterly, away from Block One. Excavation Block Seven is ten meters north and twelve meters west on a straight line from the end of the excavated portion, but again, no evidence of any ditch similar to these was present in Block Seven. Somewhere between these blocks, the ditch turns again, or ends.

EXCAVATION BLOCK THREE DITCH

While the ditches in Excavation Block Two are still fairly intact, only a small remnant of a similar ditch was delimited in Excavation Block Three (Figure 9.8), less than two meters long. This trench was not noted as such until the area between E961 and E962 had been excavated and the trench appeared in the E961 profile (Figures 8.14 upper, 9.9 upper), where there was a definite

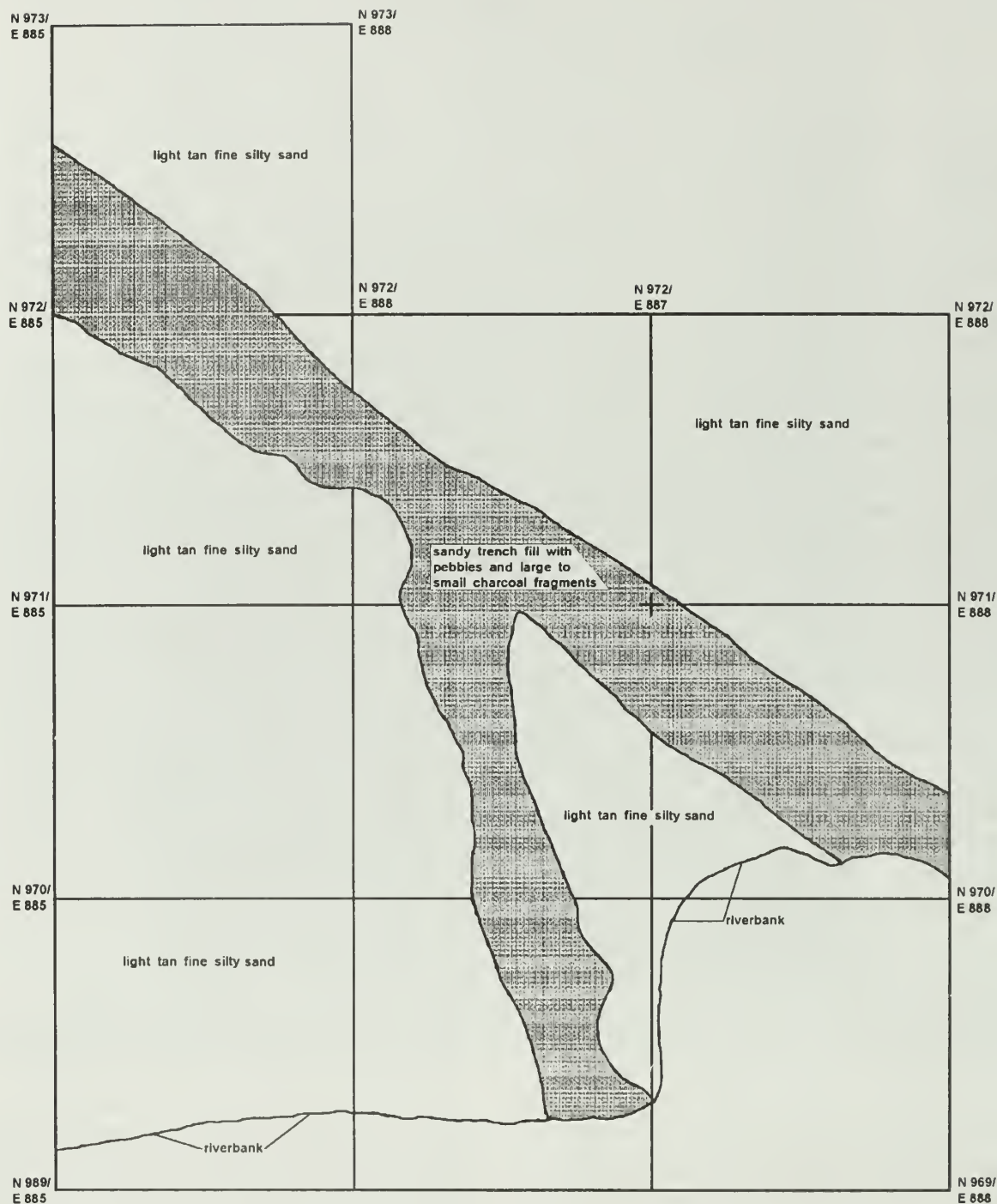


Figure 9.5: Plan view of unlined ditch feature, Excavation Block Two, showing extent and appearance of feature.



Figure 9.6: Closeup view of west wall, unit N971-972/E866, showing unlined trench before complete excavation.

vertical appearance to the north wall of the ditch. It also appeared in plan view at this time (Figure 9.9 lower). The riverbank erosion had already removed the most of the south wall of the ditch (Figure 9.10). Based on the preserved remnant, it appears this ditch was the same approximate size as the two ditches from Excavation Block Two.

One manner in which this ditch differed from the those in Excavation Block Two was the wood plank lying in the bottom of the ditch (Figures 9.8, 9.9 upper, 9.10). This plank appears to have been originally at least 5-6 cm (2.0 inches) thick and 20 cm (8.0 inches) wide. The east end of the board was burned, so its total distance in that direction could not be determined.

Similarly, the west end of the board had been destroyed by riverbank erosion, so its total length in that direction also could not be determined.

There were at least nine cut nails driven through the board. The heads of these nails were flush with the bottom surface, so the nail tips were pointing skyward. When this ditch and board were first exposed, it was thought this might be a sill or foundation log for some unrecorded structure in the area. However, with the nails pointing upward, this idea did not really make sense. It is now felt the board was just fortuitously placed in the bottom of the ditch.

Also associated with this ditch feature was an area of burned wood containing many



Figure 9.7: View of unlined ditch, Excavation Block Two, looking northwest, showing original ground level relief and orientation of two forks on south end.

cut nails and hand forged spikes (Figures 9.8, 9.11 lower, 9.11 upper). This burned area was fairly extensive (Figure 9.9 lower), but confined to a linear distribution just east and adjoining the ditch and associated wood plank. There are two layers of burning in the feature, separated by one to two cm of sediment. The top of the ditch plank was associated with the lower of the burning episodes, but it was not burned to the extent as the wood in the main burn area. The heaviest area of the burn (in both episodes) was found in N963/E962 (Figure 9.11 upper) but with lesser amounts over the rest of the two meter square area. Based on artifact types (hand forged hooks, large spikes, long bolts, strap metal, etc.), it

appears that several pieces of wood that had been used for doors or shutters were piled in this area and burned.

After excavation, it became apparent this burned area was restricted to the bottom of a small paleogully that had run perpendicular to the riverbank (Figure 9.12 lower). These burned areas are obvious in the N965 profile (Figure 9.11 lower, also see left side Figure 9.9 lower). The burned layers are among the lowest in the gully fill sequence, with the lower level separated from the Pleistocene river terrace sands by less than one cm of fine clay sediments. This position in the profile suggests a rapid depositional sequence for the filling of the gully. This is especially so when considering the main dump episode

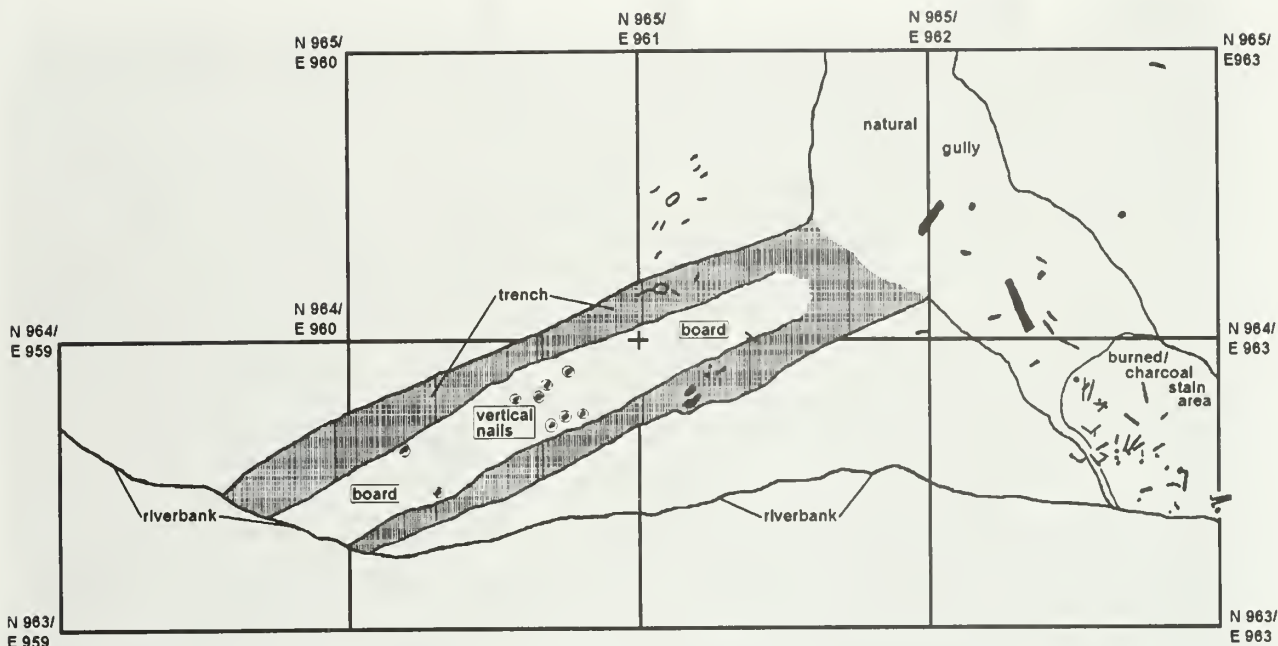


Figure 9.8: Plan view of ditch feature, Excavation Block Three, showing relationship between ditch and natural gully to east.

being excavated in this block area was within the top 20-30 cm. If the dump feature dates to the 1880s, this burned feature and associated ditch date before that, possibly to the earlier military occupation of the fort. Therefore, over half a meter of this gully filled in less than 20 some years.

Discussion

These three ditches remain an enigma within the context of the Fort Laramie Quartermaster Dump area. They were constructed before the deposition of the dump artifacts themselves. Exactly when these ditches were constructed is unknown. Based on the association with the filled natural gully, the Block Three ditch was fairly early in the fort's history. As stated above, no mention of their construction or use can be found in available military records. At least two uses can be conjectured. The area where these ditches are located would be within that of the wood-walled stockade area next to the "Adobe

Corral" (see Introduction, this report). This area was first used as a livery and the ditches may have been drainage out of that structure. However, this idea does not make sense when considering the fork in the unlined trench. Water would have been flowing toward this fork, with the flow split in half by the ditch fork. Drainage would have been more efficient with just a single straight ditch. The use of wood planks lining the other ditch seems to be overkill for a simple drainage ditch. However, if livestock had access to the area, the wood planks might have been placed to protect the ditch from being destroyed by the livestock. It also should be remembered sediments in this portion of the river terrace have a high sand content and are underlain by highly permeable Pleistocene river cobbles. This suggests natural drainage should be fairly efficient and artificial aids such as ditches probably would not be all that necessary.

A second possible use that could be



Figure 9.9: Upper: E961 profile showing Excavation Block Three ditch in center of photograph, with wood plank exposed. Lower: Plan view before excavation of wood plank, showing burned outline of plank in center of photograph.



Figure 9.10: Upper: View of Excavation Block Three ditch, after removal of wood plank. Lower: dorsal view of plank, showing spatial relationships to ditch and riverbank. Also note rotted nature of wood.



Figure 9.11: Upper: Burned area in N963/E962, showing extent of burning and large metal hand forged artifacts above burned level. Lower: Ditch and gully after excavation. Note burned levels in profile.

conjectured for these ditches would be the opposite of their use as drainage aids. That is, they were being used to bring water *into* this area of the terrace. The apparent slope to the ditches would tend to negate this idea, as well as their direction of juncture with the river. If these ditches were pulling water from the river, the angle of intersection would have been directed upstream, not downstream or perpendicular. The next logical question would be, why bring water into this area. If it were to water livestock, the river was less than 20-30 meters away to begin with and it would have been easier to bring the livestock to the river. During the late 1870s and early 1880s, this area of the fort was used as a garden. The ditches could have been used to bring water into this garden area, but again, their direction of intersection with the river is not amenable to such use.

Additional research, both archival and archeological, must be conducted if we are to fully understand the purpose and use of these ditches. Archivally, this might not be plausible because most day-to-day military records from Fort Laramie are no longer available (see Introduction, this report). Archeologically, both Excavation Block Two ditches should be followed until their origins are determined. Based on their present condition, these should be easy to follow, although the excavations may be extensive depending on the distance to their origins. As stated earlier, all remains of the Block Three ditch have apparently been eroded into the river and nothing remains of that feature. However, it might be interesting to conduct further excavations in the remnants of the natural gully to see if additional Euroamerican ditches connect with it.

WOOD STOCKADE FENCE

A major goal of the 1994 investigations was to locate the remains of the "Adobe Corral" (see Introduction, this report). We hoped to find this structure during the remote sensing phase of the project, and then confirm its presence with archeological excavations. No positive location for the structure was found, although, at the end of the 1994 excavations, we felt we had a better idea on its location. However, while the Adobe Corral was not located in 1994, part of a structure associated with the corral was found. This is a wood yard fence east of the corral (see Figures 1.13 and 1.14).

Excavation Block One was primarily placed over a high concentration of metallic objects located during the remote sensing (Figure 4.9). There was also a post remnant still in place in the riverbank on the west end of this block area (Figure 9.12). Excavations above this post quickly revealed what appeared to be another board, or part of the post, lying next to the post remnant (Figure 9.12). As excavations proceeded, this small board remnant was found to be at least 3.5 m long, extending to the northeast corner of the block excavations. Lying on top of the board was a large pile of artifacts, indicating the board had been placed on the ground surface before the artifacts (Figure 9.13).

After removal of the artifacts, this board became completely exposed (Figure 9.14 upper). This board was oriented, from the south end, at 339° from magnetic north, or 9° west of present true north. The maximum width of the board is about 18.0 cm (7.0 inches) that narrows to about 9.0 cm (4.0 inches). The maximum thickness is about 4.0 cm (1.5 inches). Both the width and thickness of the board have eroded, suggesting an original size of around 5.0 x 20.0 cm (2.0 x 8.0 inches). Nailed vertically, with



Figure 9.12: Post remnant in riverbank on west end of Excavation Block One, showing relationship of flat-laying board next to post.

cut nails, to the east side of the board was a continuous series of boards (Figures 9.14 lower, 9.15). These generally were the same size as the flat board, roughly 2.0 x 8.0 inches, but are even more heavily eroded. The northwest end of this board was nailed to a post, similar to the southeast

end. This post was about the same size as the one in the riverbank, but was not completely excavated (Figure 9.16). This second post is 3.66 m (12.0 feet) from the first post found in the riverbank. Most nails used in the feature were large cut spikes, greater than 10.0 cm long. It lies only one or two



Figure 9.13: Oblique view of Excavation Block One, before removal of artifacts overlying long board.

cm below the trash dump feature felt to date from the late 1880s.

The archeological evidence clearly shows that the main horizontal board in this feature was about a 2x8 inch board, roughly twelve feet long. It was nailed horizontally into two posts (on either end). These vertical posts were either rotted, broken, or cut off just above the elevation of the horizontal board. At least nine, and probably more, upright boards were nailed onto the horizontal board on its east facing edge. These have also been rotted, sawn, cut, or broken off at the elevation of the horizontal board.

Based on this description, the feature appears to be a segment of fence similar to the wooden wagon yard fence/wall placed on the east end of the Adobe Corral in the late

1860s. From a photograph taken in 1868, this recovered wood fence is seen to have a similar construction. That is, tall posts for the main support, with vertical boards nailed to three stringers between the posts (Figure 1.14). Based on the generally north orientation of this recorded remnant, it was felt in 1994 to most probably be a portion of the short segment of wall that extended south from the Adobe Corral (Figure 1.13). As such, it should intersect the Adobe Corral to the north, within a relatively short distance. Were that intersection to be found, one could then determine exactly how the Adobe Corral appears in the archeological record. As discussed above (see Introduction, this report), the last record of this corral is probably in the early 1880s. If the fence was



Figure 9.14: Upper: Length of board in Excavation Block One, showing orientation from riverbank, looking east. Lower: Central portion of board, looking southwest, showing upright boards nailed to east side of board.

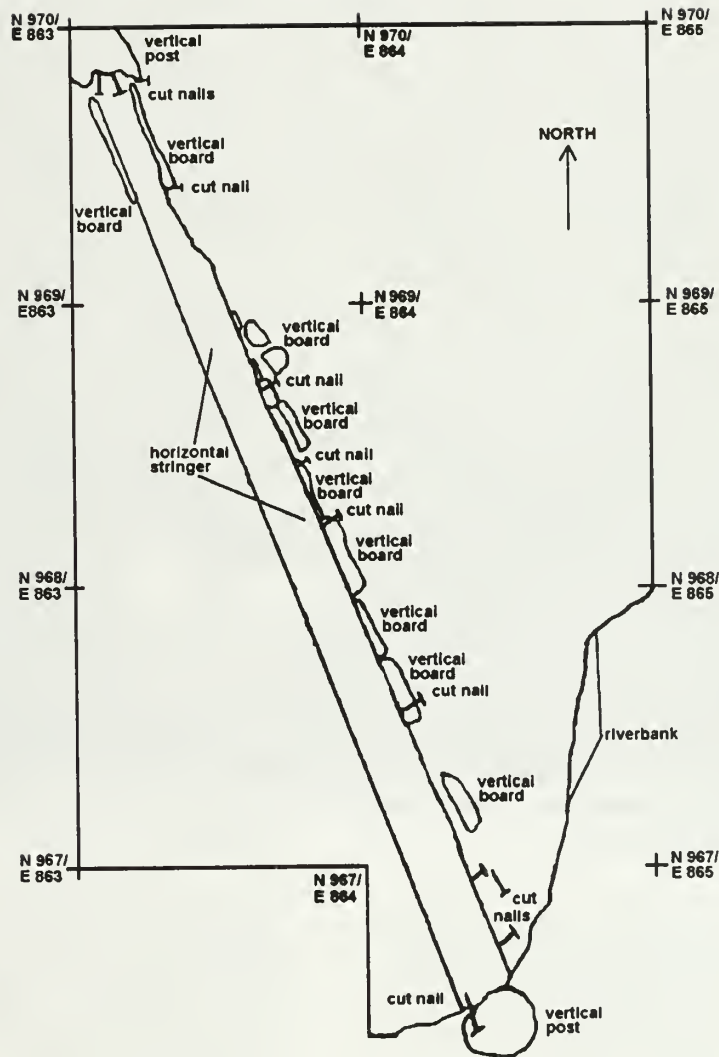


Figure 9.15: Plan view of board feature, Excavation Block One, showing flat-lying board, vertical boards and two posts at either end.

removed shortly after that time, the late 1880s date for the placement of the dump feature is to be expected.

1996 FENCE EXCAVATIONS

Additional excavations were conducted along this wood fence line in 1996. The object of these excavations was to follow the fence outlined in 1994 (Figure 9.15) until its end, supposedly within the elevated irrigation ditch sediments, and determine if any remnant of the Adobe Corral was present at that location. An additional thirty-six m₂

units (Figure 9.17) were hand excavated north and west of the 1994 block area. Ten meters of additional backhoe trench were also excavated.

The dump episode recorded on the west end of Excavation Block One continued both north and west for an additional two meters. All artifacts recovered in 1996 were similar to those found in 1994, with the exception that more complete bottles were found in 1996 than in 1994. Beyond this two meters, the artifact distributions was immediately



Figure 9.16: Post at northwest end of board feature in Excavation Block One, showing relationship between post and flat-lying board.

reduced, similar to other dump episodes where the limits of the dumps were sharply demarcated. Few artifacts were found in the remaining units north of this dump feature. Again, this illustrates how the anomalies recorded by the remote sensing are distinct and individual events.

The line established by the two posts located in 1994 continued north/northwest, for another two posts, again set 12 ft between posts like the 1994 pair (Figure 9.17, posts 3 and 4). This resulted in a line of posts 36 ft long. No post was found at the next 12 ft length, but Post 5 was then recorded 10 ft away from Post 4, but on a different line, offset 1.5 m east. This post was directly under the elevated irrigation ditch postulated as the south wall of the Adobe Corral.

Scattered along the length of the distance

between Posts 2 and 4 were additional pieces of board, similar to that recorded between Posts 1 and 2 in 1994. Most of these were between and west of Posts 2 and 3 (N969-971 E861.5-862.5). Like the fence remnant recorded from this dump feature in 1994, these boards were covered by artifacts. However, the 1996 boards appeared to be a pile, and were not part of a formal structure, like the fence bottom stringer from 1994. The fence stringer recorded in 1994 did not continue north as expected, although some boards found between Posts 2 and 4 in 1996 (Figure 9.17) originally may have been such a stringer.

Contrary to expectations, no clear evidence, such as a rock or adobe brick foundation, of the base of the Adobe Corral wall was visible within the sediments of the elevated irrigation ditch near the end of the

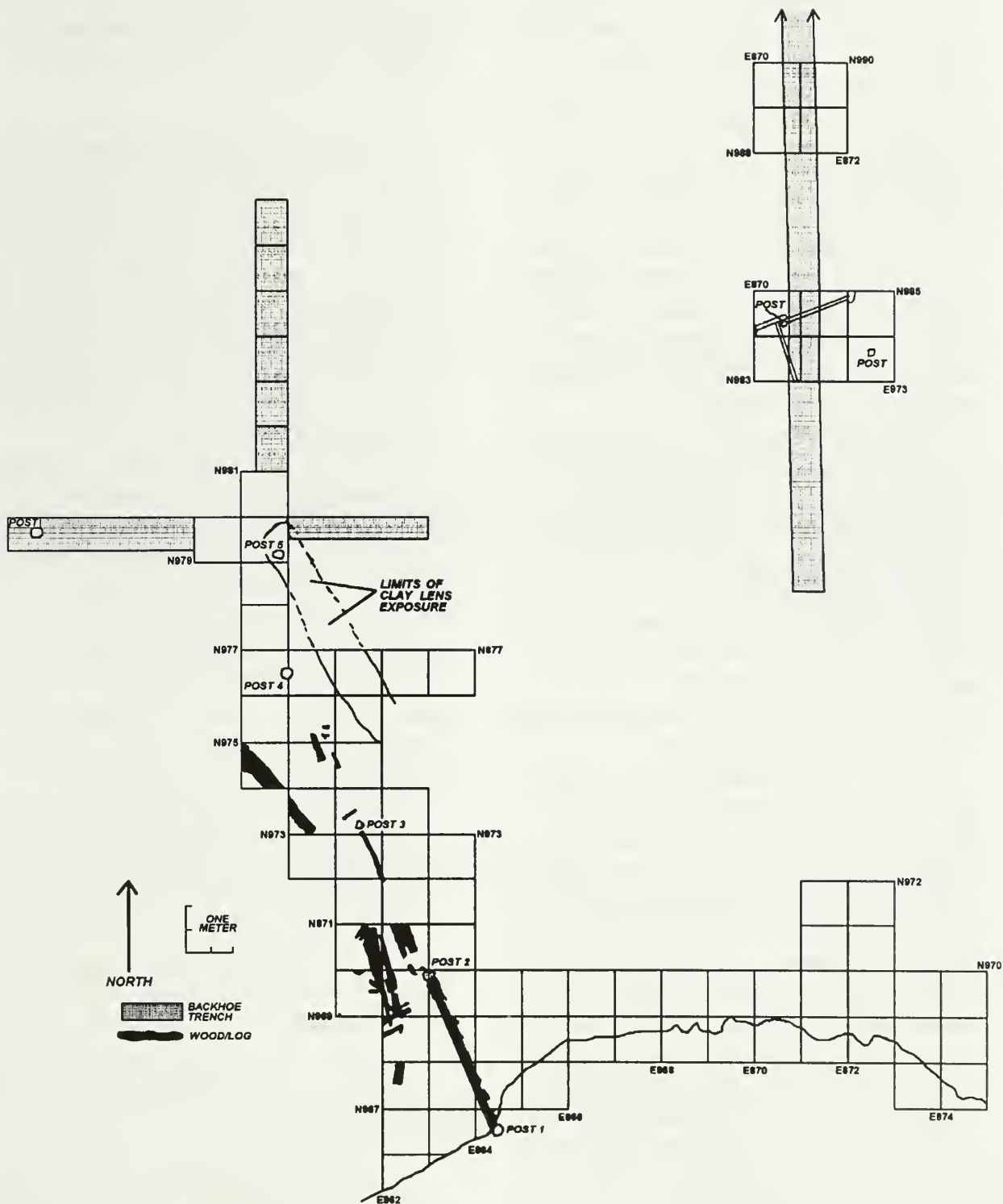


Figure 9.17: Plan map, Excavation Blocks One and Seven; showing features found and relationships between excavation blocks.

fence line. However, close examination of the stratigraphic profile across the elevated ditch (Figure 9.18) shows a stratigraphic sequence between N980-981.5 distinctly different from all other stratigraphy recorded in other units or excavation blocks. This short area of the profile shows a remnant section of pre-1880s natural sediments. This section, and its associated sediments toward the river, are covered by a massive medium/tan silty sand, with no stratification, until the area of the dump episodes along the riverbank is reached. The infilling of the elevated irrigation ditch can be seen immediately north of N981. This ditch is visible between N981-983.8.

Below and north of this irrigation ditch, two massive sediment layers comprise the entire sequence. No detailed stratification of any type could be seen in this area of the profile. In general appearance, this area of the profile appeared to have been deposited during a single event. Also note the second ditch looking feature below the irrigation ditch fill between N983-984. This is a smaller ditch, filled with similar sediments as the massive, one time event.

Based on this stratigraphic sequence, this area between N980-981.5 is now felt to be the only remnant of undisturbed pre-military age sediments in this part of the project area. The section was preserved because originally it had the base of the Adobe Corral wall lying on its top. This held the section intact from erosional activities through the 1880s. Following military abandonment in 1890, the section was further preserved by construction of the elevated irrigation ditch to its immediate north, using the wall base as the southern half of the ditch base. Construction of the ditch north of this preserved section resulted in deposition of the two massive sedimentary

units on its north side. The lower "ditch" feature below the main irrigation ditch is considered to be the drainage ditch known to have been dug around the outside of the Adobe Corral (see Introduction, this volume).

However, the assumption being made at the end of the 1994 season was the elevated irrigation ditch formed the base of the south wall of the Adobe Corral. If the smaller ditch was the exterior drainage ditch for the south wall, it should be south, not north, of the wall base. Therefore, the wall base remnant can only be the north wall of the Adobe Corral, which in turn, can only mean a major part of the Adobe Corral has been lost from riverbank erosion.

When did this erosion occur? Examination of a series of Soil Conservation Service (SCS) aerial photographs taken between 1938 and 1976 (on file, Fort Laramie National Historic Site) show an additional 10-15 meters of terrace present in the study area during this time, based on the known position of the elevated irrigation ditch. These photographs show the riverbank was stable throughout this time, with a number of shrubs and trees anchoring the bank.

Oblique aerial photographs taken during the 1984 flood (on file, Fort Laramie National Historic Site) which caused major erosional damage to the riverbank upstream (Scott and Conner 1984) show the flood waters outside the riverbank and reaching almost to the elevated irrigation ditch in this area. Because of the massive damage done to the riverbank upstream (Scott and Conner 1984), it is obvious enough energy was available for similar erosional action only two or three hundred meters downstream.

If 10-15 meters of riverbank were eroded from the project area during the 1984 flood, the original river channel would now be the

FORT LARAMIE NATIONAL HISTORIC SITE

1996 QUARTERMASTER DUMP PROJECT

BLOCK 1 -- EAST WALL E860, N972-9987

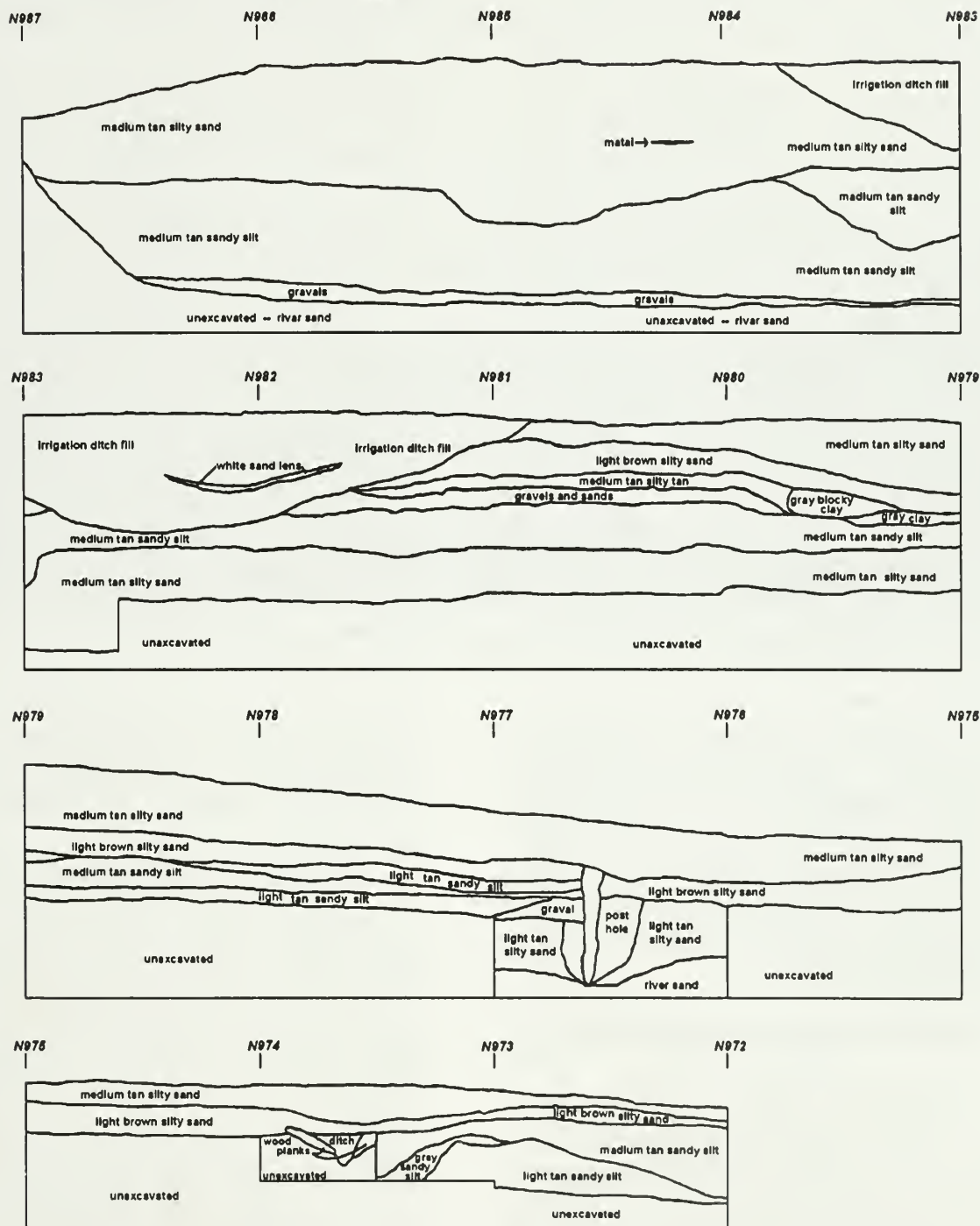


Figure 9.18: North-south stratigraphic profile across elevated irrigation ditch, N972-987, 1996 Excavation Block One.

abandoned cobble covered channel south of the present channel (Figures 1.2, 1.4). If the elevated ditch does represent the base of the north wall of the Adobe Corral, the south and west walls, most of the east wall, and over one quarter of the north wall are no longer extant on the riverbank.

Also, based on the 1996 excavations, no information was recovered that could be used to determine if the original wall of the structure was constructed from adobe brick or sod. If constructed with adobe, all bricks had been removed. If constructed from sod, no remnant of the wall was still standing on its base. It was also evident, that at least in this area, no rock foundation was used for the base of the wall.

The next question that must be addressed is the source of the massive sediment units on the north side of the postulated wall base. Two distinct soil units were present here (Figure 9.18), therefore two sources are indicated, and immediately apparent. The first is the actual wall itself, if the wall were sod. The sod blocks could have collapsed to the north, forming the lower unit. Later, an area north of this feature appears to have been machine scraped to the Pleistocene river gravels, with the scraped sediments pushed south, forming the upper stratigraphic level (Figure 9.18) and the main part of the elevated irrigation ditch.

EXCAVATION BLOCK SEVEN STRUCTURE

During the excavation of Block Seven, two posts and at least three vertically placed boards were recorded. Based on the appearance and distribution of these boards (Map 7), it appears they represent the remains of some form of structure with the feature continuing an unknown distance west. One

portion of this structure, about six feet across, appears to be complete in the excavated area (Figure 9.19). If Excavation Block Seven is within the wood wagon yard fence area, it is possible this may represent a manger or stall for livestock. A similar size feature may be represented by the remnants of the structure extending to the west. The features approximate orientation to true north also would suggest its association with the various Quartermaster structures within the wagon yard or Adobe Corral.

The lack of ceramic/glass artifacts and low amounts of metal artifacts suggest this feature is not a living or habitation structure. The high quantity of bone recovered, both during hand excavation and backhoe trenching, also suggests the feature may have been used as a bone disposal after abandonment of its original use. Datable artifacts recovered do suggest an 1880s date for its final use as a dump feature. Additional excavations, primarily west, but also east and south, should be conducted on this feature to further outline the original extent and use of this structure. Based on artifact distributions and the positioning of the north boards, the north limit of the structure has been located.

EXCAVATION BLOCK SEVEN IRRIGATION HEADGATE

A second feature located in Excavation Block Seven is a large concrete headgate for a lateral irrigation ditch (Map 7). This structure was also found during the excavation of Backhoe Trench One. This trench was placed across the early 1900s elevated irrigation ditch (see Figure 1.17) that also shows up on the remote sensing maps of this part of the study area (Figure 4.9). This backhoe trench was excavated across the elevated ditch to see if any remnants of the Adobe Corral were present under the ditch.



Figure 9.19: View of Block Excavation Area Seven structure, looking east. North wall of structure on right side of block area. Southeast post in north-central part of excavated area.

The location was also selected to investigate the large metallic anomaly that appears in the middle of the elevated ditch (Figure 4.9). We now know this anomaly is this concrete headgate feature, primarily the large sheet of metal (part of a car fender) that was placed on the upstream side of the headgate as the gate itself (Figure 9.20). Lying near the north side (downstream) of the headgate was a large galvanized metal chimney cap (Figure 9.21). This chimney cap is similar to that found on many military buildings at Fort Laramie (Steve Fullmer, personal communication 1994). Why it should be lying on the downstream side of a lateral irrigation ditch is unknown.

No record was found in the Fort Lara-

mie archives concerning the construction of this lateral ditch. Presumably, it would have been to provide water to the hay meadow north of the project area. It is also unknown whether this lateral predates or postdates the lateral appearing in the 1910 photograph (Figures 1.17, 4.9). With the presence of the car fender as part of the headgate, one would assume this is a later lateral and headgate.

BACKHOE TRENCH TWO FEATURES

Three Historic era features were noted during the excavation of Backhoe Trench Two. Because these were found near the end of the field season, and there was no time for



Figure 9.20: View of concrete headgate and associated sheet metal in Excavation Block Seven, looking northeast.

proper excavation, these features were not examined further than that visible in the backhoe trench. While photographs were taken of the features, they are not included here because of their dark exposure being in the bottom or sidewall of the trench. All three features were reburied when the backhoe trench was backfilled.

The first of these features was a small area of butchered bone, primarily *Bos taurus* (domestic cow), and *Ovis aeries* (domestic sheep), at an approximate provenience of N1020/ E865. This was a small area, about 40 cm north-south and 50 cm east-west, that may have been a depression or even a small hole from the ground surface. Evidence for the original shape of the

feature was largely destroyed by the backhoe. The feature (i.e., area of bone) appeared to have been centered in the backhoe trench, because no bone could be found in the sidewalls of the trench. All the bone present in the backhoe trench and what could be recovered from the backdirt was collected and retained for analysis.

The second feature found in this backhoe trench was a single vertical post about 1.2 meters north of the bone pile feature. This post was found in the north wall of the backhoe trench. The post base was still present in the post hole. It appears the post had been placed in the hole, and then held in place by several large rocks, including one commercial brick, that had been jammed into the



Figure 9.21: Chimney cap lying on downstream side of lateral irrigation ditch headgate recorded in Excavation Block Seven.

hole. The post appears to have been around 15 cm thick, with the top of the preserved portion 45 cm below the present ground surface. There was a minimum of 45-50 cm of post still present, extending into the cross-bedded river sands found below the historic cultural levels. Placing this post into such a sand deposit probably explains why it was held in place with the rocks. Based on the stratigraphy in the backhoe trench, it does not appear there is any direct connection or correlation between the bone pile feature and this fence post, despite their closeness. Additional excavations in this region might clarify their relationships, if any.

The last feature found in Backhoe

Trench Two is a large charcoal stain lying 45 cm below the present ground surface near N1019-1020/E856-857. This stain is 10 cm thick and approximately 70 cm long east to west. It is possible this stain might be the remains of a dugout or privy depression. The west end of the charcoal stain does appear to be a vertical wall, as would be expected. However, the east end has been highly disturbed by rodent activities and its original shape could not be determined. No artifacts were seen to be in association with the feature. Additional excavations will be needed to learn the origin of this charcoal stain.

Table 9.1: Summary of origins for individual dump episodes, 1994 Fort Laramie Quartermaster Dump Project.

| DUMP EPISODE NUMBER | EXCAVATION BLOCK NUMBER | GENERAL DESCRIPTION |
|------------------------|----------------------------|---|
| 1 | 1 | 1880s Officer's Quarters |
| 2 | 1 | 1880s Construction materials |
| 3 | 1 | Possible 1880s Officer's Quarters |
| 4 | 1 | Possible 1880s Enlisted Men's |
| 5 | 2 | 1880s Officer's Quarters |
| 6 | 3 | Possible 1860s-1870s construction material |
| 7 | 3 | 1880s construction materials |
| 8 | 3 | 1880s saloon/trading post cleanup |
| 9 | 3 | Bone scatter |
| 10 | 4 | 1880s non-Officer material |
| 11 | 4 | 1880s non-Officer material |
| 12 | 4 | 1880s non-Officer material |
| 13 | 4 | 1880s non-Officer material |
| 14 | 5 | 1880s Officer and 1890s civilian material |
| 15 | 5 | 1880s Officer and 1890s civilian material |
| 16 | 5 | unknown origin, probably non-Officer material |
| 17 | 7 | Quartermaster employee bone scatter |

TRASH DUMP FEATURES

As postulated following the remote sensing phase of the project, concentrations of metal showing on the remote sensing maps were felt to represent individual wagon dumps of trash from cleanup episodes at the fort. Based on the excavations along the riverbank (Maps 1-6), these individual wagon dump episodes can be documented archeologically as well. These can be defined by artifact concentrations within a set area, usually less than two or three meters in diameter. A distinct gap exists between one dump load (concentration) and the next. This gap between dump episodes is usually evidenced by a complete cessation of artifacts, but occasionally by a major lessening in artifact numbers. Generally, a minimum of 16 dump episodes, i.e., artifact

concentrations, can be postulated for the 1994 excavated area at the Quartermaster Dump (Table 9.1). One additional concentration area is felt to represent localized dumping by civilian Quartermaster employees.

EXCAVATION BLOCK ONE DUMP EPISODES

A minimum of three dump episodes, and possibly a fourth, can be seen in the artifact distributions in Excavation Block One (Map 1). These begin with the pile of primarily glass and ceramic artifacts along the west edge of the block, overlying the remnants of the wagon yard fence described above (Figures 9.14-9.15). Based on preliminary analysis and dating of artifacts, this dump episode appears to be material from a late 1880s Officer's quarters, where the officer

also had his family with him. Officer's uniform insignia, women's items and children's toys also suggest the material was not from an enlisted men's barracks, or even from a Non-commissioned Officer's quarters. The women's items especially are "well-to-do."

The second dump episode in this block is an area of construction material, primarily represented by decomposing lime grout/cement materials (Map 1). While only small areas of this were actually mapped, field notes indicate the lime grout was found throughout this 2x3 meter area, along with several pieces of rotted and decomposed wood. A higher concentration of bone material was also recorded in this part of the block excavation. There were some glass and ceramic artifacts in the area, but may represent fallout or scatter from the western dump episode. If this disposal area represents a construction area that was being cleaned up, it is also possible that all household and domestic artifacts lying on top of the lime grout might represent yet another dump episode (the fourth for Excavation Block One) that was placed directly over the lime grout dump. If so, archeologically the two features cannot be separated, other than the lime grout appears at the bottom of the dump pile. The definition between these two dump episodes is based on the household items versus the construction materials.

The third dump episode lies east of the lime grout, with a distinct break in artifact distributions between the two defining the separation. Ceramic material recovered from this dump episode is more utilitarian than from the west dump pile, with most being yellow ware. This probably represents a small cleanup from an enlisted men's area. The ceramics, and other artifacts, were military in origin, although many beer

bottles suggest this dump pile might not have been entirely from a barracks. One also could postulate based on the spatial arrangement of this dump pile (Map 1) a positioning of the wagon on the west side of the pile, with most trash having been dumped out the back of the wagon but some over the side.

EXCAVATION BLOCK TWO DUMP EPISODE

Only a single dump episode can be readily discerned within the artifact distributions in Excavation Block Two (Map 2). This appears to have been centered on three meters east of the west end of the block, with a decrease in artifact densities both east and west. A distinct end to the dump episode was located on the east side. Based on the artifact densities, the dump episode probably ends to the west and north within another meter. It also appears the artifacts may have been scattered to a larger extent than the other excavated dump episodes. Like the first concentration from Excavation Block One, this dump episode also appears to have been from an Officer's Quarters, again based on the presence Officer's insignia and other "well-to-do" household items.

EXCAVATION BLOCK THREE DUMP EPISODES

Four dump episodes can be proposed for the area within Excavation Block Three (Map 3). The first of these (from the west) is the area of burned construction material described above as being at the bottom of the fill gully, associated with the ditch feature. Based on stratigraphic position and artifact types, this feature probably dates before 1880, and even as early as maybe 1860.

Another area of construction materials was located east of the burned pile. This dump episode consisted primarily of an area of rotted and decomposed wood, lying over a three or four square meter area. Strati-

graphically, this dump episode is much younger than the burnt pile from the west end of the excavation block. No datable artifact types were found within the wood pile. The bottom of the pile lay at the contact of the original military era ground surface.

The third dump episode from Excavation Block Three was recorded immediately above and over the construction material dump. The two episodes were separated by one-two cm of sediment, indicating their distinctness. A large quantity of broken alcoholic beverage bottles was the main emphasis of this dump episode. Thus, it can be proposed this dump episode was primarily associated with the saloon in the Post Sutler's Store. Almost all bottles were totally shattered to pieces smaller than five cm. Because of the small size of these fragments, this glass distribution does not appear on the excavation map (Map 3). Enough remains of the bases and finishes to date the dump episode to the 1880s.

The final dump episode from Excavation Block Three was recorded from the easternmost three to four meters of the excavation block. While some glass and metal artifacts were recovered, this dump episode is evidenced on the excavation map (Map 3) primarily as a widespread scatter of bone, both domestic cow and domestic sheep. Like the dump episode from Excavation Block Two, this bone dump is fairly scattered relative to the other dump episodes recorded. Whether this was scattered during the actual dumping or was because of carnivore activity will be determined during detailed analysis of the bone.

EXCAVATION BLOCK FOUR DUMP EPISODES

Four dump episodes can be proposed for Excavation Block Four (Map 4). The two

episodes on the west end of the block area have mostly eroded into the river and only remnants remain. Lesser amounts of the last two dumps were eroded, and it appears these two episodes of dumping are mostly intact, especially the fourth (easternmost) dump episode. Based on artifact types, it appears that most of these four dump episodes can be related probably to cleanups from enlisted men's living quarters. It is possible they also may be related to civilian employees of the Quartermaster Corps. Relative to other dump episodes, few military artifacts were recovered from any of the Excavation Block Four dumps.

EXCAVATION BLOCK FIVE DUMP EPISODES

Excavation Block Five was originally positioned over a large concentration of metal artifacts recorded during the remote sensing survey. This placement was to examine such an area away from the riverbank. The block was designed to intersect what appeared on the remote sensing maps to be the break area between two dump episodes. Once the excavations were completed, it appears this was actually the case (Map 5). The main area of metal in Block Five was on the eastern side of the block. The second area, which showed on the remote sensing, is the smaller area of metal along the western meter of the block. This area continues west of the excavation block, and is probably similar in size and composition as the main area in the block.

The main artifact concentration area in the block may actually represent two dump episodes fairly closely spaced. The narrow space lacking artifacts across the lower third of this metal concentration may be the separation between these two episodes. This apparent gap between dump episodes also may just be fortuitous and this pile of metal

may represent only a single dump episode. Artifact materials from this (these) dump episodes also represent more than one time period. 1880s military objects (primarily uniform parts) were found throughout the pile, but at least one alcoholic beverage bottle made after 1890 was also recovered intact. Other such later bottles also may be present in the pile, but have not been analyzed. Thus this dump episode represents both military and civilian occupation at the fort. The civilian materials would have been brought into the area after the fort was abandoned by the military. The apparent break in artifact distribution does not suggest a civilian dump on top of a military, because the various artifact types were found mixed in the northern two-thirds of the dump pile.

EXCAVATION BLOCK SEVEN DUMP EPISODE

Bone recovered from Excavation Block Seven also represents a dump episode. However, here it is felt the material was not brought down the river from the main fort area, but represents a toss zone established by the civilian Quartermaster Corps employees. The general lack of other artifact types (ceramics, glass, metal) indicates the main reason for the bone pile was its disposal within the excavated feature (see above).

CHAPTER 10

FAUNAL REMAINS

by

Houston Rogers, Alan Bartholomew, and Anne K. Armstrong

INTRODUCTION

Investigation of faunal remains provides insight into past lifeways of people, which is a goal of archeology (South 1977). Without these investigations, contemporary societies could not trace their ancestral histories and would lose a large part of what defines them as a group today. By examining the faunal remains recovered from the Fort Laramie Quartermaster Dump Project, and how they were prepared for consumption during the Fort Laramie military occupation, we are able to trace the evolution of our eating habits over a one hundred-year period.

The obvious strategic importance of its proximity to natural land routes across the Northern Plains allowed Fort Laramie to serve as a staging point for the Indian Wars campaigns. Fort Laramie was the operational headquarters for "pacification" of the Northern Plains Indian tribes during the 1860s and 1870s. It was ideally located because it had an adequate supply of fresh water and fertile riverine flood plains for the grazing of cattle, sheep, and horses. It also was easily reached from the supply depots at Cheyenne, Wyoming by several days ride.

DOMESTIC ANIMAL SUPPLY AND SUBSISTENCE

THE QUARTERMASTER DEPOT AT CHEYENNE

In 1867, a military post and general supply depot, originally called the Cheyenne Depot, was established along the proposed route of the Union Pacific Railroad from which all of the posts north along the eastern base of the Rocky Mountains would be supplied (Adams 1994). The depot, later renamed Fort D.A. Russell, supplied the outlying forts, such as Forts Fetterman, Fred Steele and Laramie, with clothing, equipment, fuel, ordnance, and, most important, food. The depot's proximity to the railroad allowed for the transport of fresh fruit and vegetables obtained from markets near the post and from farmers in Colorado (approximately 450,000 pounds within the first year of operation alone) to the outlying posts (Adams 1994).

THE SUPPLYING OF DOMESTICATED ANIMALS TO OUTLYING FORTS

Records show conflicting policy concerning the supply of domesticated food animals to posts throughout Wyoming. At Fort Fetterman during General Crook's campaign of the spring of 1876, records show the Quartermaster Depot in Cheyenne supplied the fort with thousands of pounds of pork

and over a hundred head of cattle (Hedren 1988:88). It appears that the same was happening at Fort Laramie. However, at posts such as Fort Fred Steele, records show that they were purchasing cattle on the hoof from local ranchers (Sam Drucker, personal communication, 1996) [see also Frazer (1983); Miller (1989); Wheeler and Landis 1996)]. This apparent conflict in policy could be due to Fort Fred Steele's proximity to the Union Pacific Railroad where supplies of domesticated food animals would be in great supply in the local economy (i.e., ranches and farms).

At posts such as Fort Fetterman and Fort Laramie, the lack of direct access to supply by rail necessitated reliance upon Cheyenne. The approximately 140 kilometers from Cheyenne to Fort Laramie could have been covered in a drive of about a week or so. After arrival, cattle and sheep could graze within the vicinity of the fort. Evidence of corrals, stock pens, and fencing at Fort Laramie seems to support this assumption. Likewise,

. . . the most common method for supplying fresh beef was to purchase the cattle on the hoof from local ranchers or dealers and drive them to their destination post. Then that military unit would graze the animals near their post until needed (Hafen and Young 1938:99).

By the time of the military occupation at Fort Laramie, most wild game species probably had been depleted from the region. A traveler through the Fort Laramie region in 1839 noticed that "hunting is the sole reliance for food" (Hafen and Young 1938:61). A similar pattern was noted in 1845 when "fifty head of sheep and twenty five beef

cattle were driven to supplement the food supply" (Hafen and Young 1938: 110). By the time of military occupation of the fort four years later, domesticated animals were likely more important as a food supply than non-domesticated animals. Furthermore twenty years of hunting around the fort before the military occupation must have had great effects upon native animal populations. This was also noted by Cooke in 1845 who stated "they live nearly exclusively on dried buffalo meat, for which the hunters go at least fifty miles; but they have domestic cattle" (Hafen and Young 1938:110). The military could just as easily have shipped food into Fort Laramie than send hunters fifty miles or more into hostile territory to find meat.

Transportation on the frontier was a difficult task. Wagons had to carry rations hundreds of miles over rough terrain. The rations often arrived at the post unfit for human consumption, or if they had arrived safely, the rations still ran the risk for becoming contaminated by rodents, insects, or ruined by spoilage while in storage at the Commissary store (Caperton and Fry 1974).

Regardless of whether domesticated food animals were acquired through civilian contractors or from the Quartermaster Depot in Cheyenne, once at a fort, the supplies were distributed following standard procedures (Figure 10.1). All goods had to pass through the Quartermaster Depot of the fort so that supply and subsistence could be tabulated. From the Quartermaster Depot of the fort, domesticated food animals would then arrive at the Subsistence Department where they were again recorded. From the Subsistence Department animals ready for butchering would arrive at the slaughterhouse. Domesticated food animals were typically skinned, disarticulated, halved or

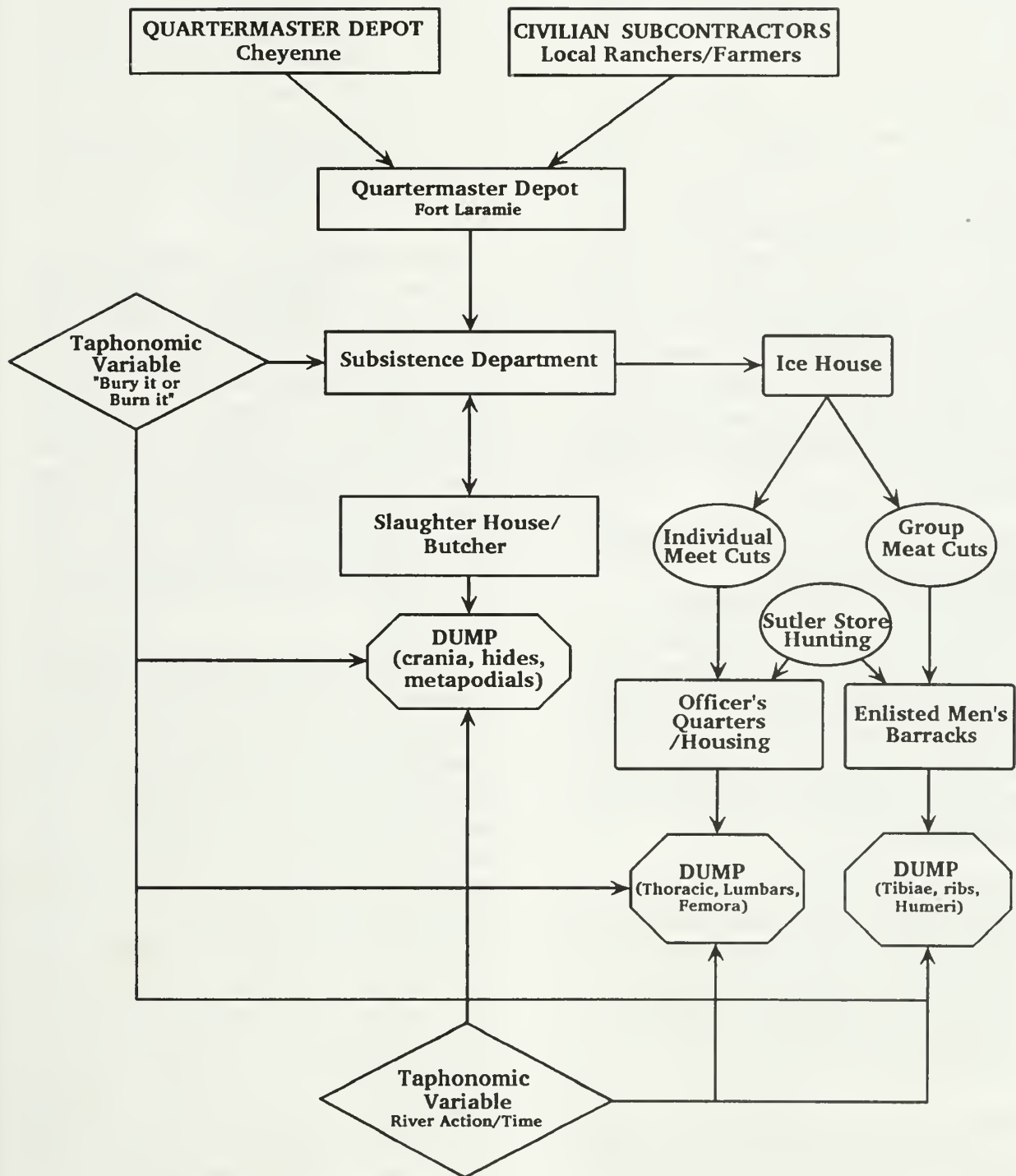


Figure 10.1: Flow chart of typical subsistence patterns at western military forts in late 19th century.

butchered into units, and sent to the Ice House, passing again through the Subsistence Department to be recorded. Once in the Ice House, the halved/butchered units were stored until needed by the Officers and Enlisted Men of the fort.

From the preceding, it can be assumed that faunal remains present at Fort Laramie would reflect patterns of frontier processes of subsistence and supply. The faunal assemblage should show evidence of cattle, sheep, and pig—subsistence—while the evidence for supply would reflect domesticated food animals arriving on the hoof. From this, it follows that there should be evidence of, first, primary butchering, second, locales of disarticulation, third, secondary butchering, and fourth, distinctive dump areas reflecting these patterns.

RANK, STATUS, AND SUBSISTENCE FOOD AND ITS TYPICAL PREPARATION AND DIVISION

During the 1870's, the distribution of food and its preparation at military forts followed a distinctive and repetitive pattern throughout the West. Rations, as mentioned earlier, were supplied by the Quartermaster Department to individual posts. The typical ration consisted of:

Twelve ounces of pork or bacon, or one pound four ounces of salt or fresh beef. One pound and six ounces of soft bread or flour, or one pound of hard bread, or one pound and four ounces of corn meal (Caperton and Fry 1974:29).

The inclusion of meats within the diet, evident from the above, would consist of preserved and fresh meats. Beef was often preserved in much the same manner as pork—by

packing in barrels of salt. It is easy to understand, then, the typical soldier's preference for fresh meats. Fresh beef, pork, and sheep were widely available to posts as large and as important as Fort Laramie. However, beef was usually the most available of the domesticated food animals based upon historical documentation (see Caperton and Fry 1974; Crass and Wallsmith 1992; Ehrenhard 1973; Herskovitz 1978; Jolley 1983).

When an animal was butchered, officers of higher rank typically received higher quality cuts of meat than enlisted men. (Caperton and Fry 1979; Crass and Wallsmith 1992; Herskovitz 1978). This is entirely fitting with models of subsistence based upon social status, rank, and socioeconomic position from periods past and present (Crader 1984, 1990; Gust 1983; Landon 1996; Lyman 1977, 1979; Schulz 1979; Schulz and Gust 1983a, 1983b; Shanks and Tilley 1987; South 1977a, 1977b; Spencer-Wood 1987).

Beef and mutton was usually prepared as roasts for the enlisted men. An example of a company mess from the week of February 4 through 10, 1893 at Fort Robinson, Nebraska can be presented (Table 10.1). Note that each meal consists of some type of roast beef-gravy or beef stew. To cook this type of meal, it is necessary to roast or slowly stew the meat being prepared. The chuck cut, or possibly the front shank cut, were the most common cuts used. Recipes collected from different forts from the same era and region all prepare their meat dishes similarly, often calling for stewing, roasting, or boiling of meat (Caperton and Fry 1974). Officers, on the other hand, typically enjoyed choice cuts of meat from the hindquarters such as steaks, loins, and rump roasts (Caperton and Fry 1974; Crass and Wallsmith 1992; Hers-

Table 10.1: Example of a weekly menu from Fort Robinson, Nebraska (from Caperton and Fry 1974:32).

| DATE | BREAKFAST | DINNER | SUPPER |
|------|--|---|---|
| 2/4 | Roast Beef-Gravy Potatoes-Bread Coffee | Turnips-Bacon roast Beef-Gravy Bread | Gravy-Bread Tea |
| 2/5 | Beefsteak-Gravy Potatoes-Bread Coffee-Milk | Beef Stew-Potatoes Gravy-Bread | Duff-Bread Tea |
| 2/6 | Beefsteak-Gravy Potatoes-Bread Coffee-Milk | Cabbage-Bacon Roast Beef-Gravy Potatoes-Bread | Beef Stew-Gravy Bread-Coffee Milk |
| 2/7 | Hash-Bread Coffee-Milk | Roast Beef-Gravy Bread-Potatoes | Beef Stew-Bread Tea |
| 2/8 | Roast Beef-Gravy Potatoes-Bread Coffee | Soup-Roast Beef Gravy-Potatoes Rice-Bread | Pancakes-Syrup Tea |
| 2/9 | Hash-Bread Tea | Beans-Bacon-Roast Beef-Gravy-Bread | Gravy-Bread Coffee |
| 2/10 | Roast Beef-Gravy Bread-Coffee-Milk | Sauerkraut-Bacon Roast Beef-Gravy Bread | Pancakes-Syrup Tea |

kovitz 1978).

METHODS OF BUTCHERING

Butchering at military post was usually performed by the men in shifts of duty if the post was small. At larger posts, however, butchering might be performed by professional civilian butchers or slaughterhouses (Caperton and Fry 1974). Regardless, it has been noted that butchering patterns are much the same now as they were in the late nineteenth century (See Figures 10.2, 10.3, 10.4) (Caperton and Fry 1974; Romans et al. 1977; Schulz and Gust 1983a).

A general butchering pattern for beef, sheep, and pig can be abstracted from historical records during the late 19th century (Caperton and Fry 1974) and modern techniques (Romans et al. 1977):

1. The animal is first killed by a shot or stun to the head

2. The hide, head, and feet are removed
3. The carcass is split in two by saw, axe, or cleaver
4. Vertebrae are halved sagittally by saw, axe, or cleaver
5. The sides were then quartered by saw, axe, or cleaver

Note here that a comparison of these three figures shows one discrepancy in the number of meat cuts. This may be explained by one (Figure 10.2) being a general pattern while the others (Figures 10.3 and 10.4) show a further division of the carcass into respective retail cuts.

RELATIVE VALUES OF MEAT CUTS IN THE LATE NINETEENTH CENTURY

The relative values of meat cuts for beef have been tabulated based upon statistics collected by the United States Departments of

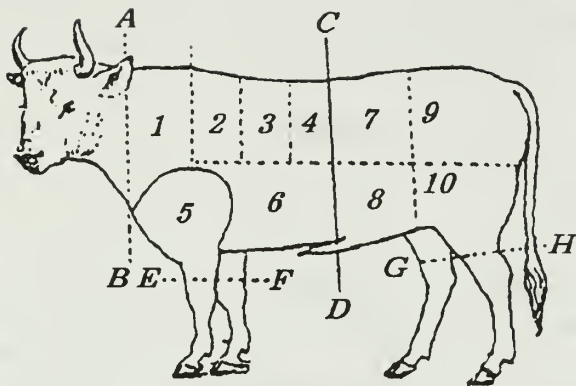


Figure 10.2: 19th century military illustration of proper butchering pattern for cattle (from Caperton and Fry 1974:30).

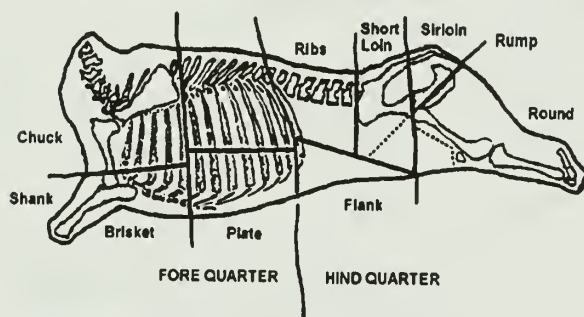


Figure 10.3: Modern butchering pattern of cattle (adapted from Romans et al. 1977:449).

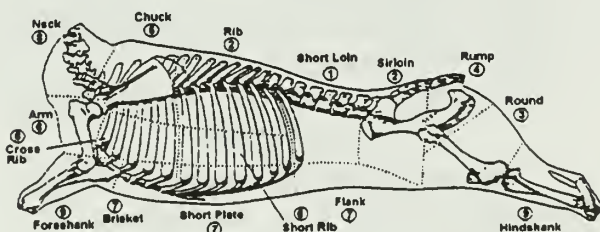


Figure 10.4: Ordinal ranking of quality of meat cut based on price per pound (adapted from Schulz and Gust 1983:48).

Commerce and Agriculture between the 1850s and the 1910s. The rankings that follow (Figure 10.4) are ordinal ranked according to price per pound for beef that is

directly related to the overall quality of the cut and geographical availability.

Based upon the above discussion, one could determine that

- 1) Enlisted men received lower ranking cuts of meat such as roasts;
- 2) Officers received higher ranking cuts of meat such as steaks and loins;
- 3) Butchering patterns will appear in the faunal record that resemble contemporary patterns; and
- 4) Beef remains should appear in higher frequencies than sheep or pig.

ASSUMPTIONS BASED UPON THE HISTORICAL RECORD

Based upon historical documents, there are several important observations directly relevant to the present study. The following are necessary assumptions concerning the provenience of the faunal assemblage, its character, and what might be expected if the documentary evidence is reliable. The importance of the following documentary record were vital in deciding the methodology used for analysis.

Despite whether beef was supplied from Cheyenne or obtained locally, it is evident that beef was not arriving in pre-butchered units. Historical records show that cattle were arriving on the hoof (Sam Drucker, personal communication, 1996) and being butchered within the confines of the fort. The presence of a slaughter house at the fort can be inferred from Post Surgeon Reports that recommends the relocation of that facility and its dump remains:

. . . the slaughter house [on the west end of the parade ground] be immediately removed and that the

ground on which it now stands be put in through police. A spot about 500 yards further down the river [approximately the present project area] is recommended as a new site. (Buchanan 1872)

Evidence that other domesticated animals, such as pigs, were being raised at the fort can also be inferred from these Surgeon reports:

. . . the slops are collected from all the quarters in the garrison once a day and fed to the pigs. 2nd all other rubbish is carted away below the Post and thrown into the Laramie River . . . (Schell 1868)

. . . the river bank in rear of Cos. H, A, and Band, is used as a receptacle for old tin cans and other offal which should be removed and further deposits prohibited. The pig pens in rear of Cos. C & I should in my opinion be removed and the ground policed, also . . . the river bank . . . (Caldwell 1884)

METHODOLOGY

Based on the above factors, the documentary evidence (Walker 1994), and method and theory for analyzing rank and status (Schulz and Gust 1983a, 1983b), the following methods of analysis were applied to the faunal remains representing domesticated animals from the Fort Laramie Quartermaster Dump blocks. All of the remains from Excavation Blocks One, Two, and Four were cataloged by taxon, species, element, portion, segment, side, butchering marks, meat cut, and meat cut rank.

When meat cut (for cattle, sheep and pig bones) and meat cut rank (for cattle bones only) could be established based upon the

work of Schulz and Gust (1983a, 1983b), remains were depicted by drawing the portion present, depicting the length of the meat cut from butchering mark to butchering mark. This was necessary to show where and how meat cut ranks were being assigned. Depiction of butchering marks within these drawings helped in determining whether primary or secondary butchering processes were taking place at the fort. Examples separating these processes include marks located on distal metapodials (evidence of disarticulation) against those located on lumbar vertebrae (evidence of steak cuts) etc.

Element, portion, segment, and side will be used to establish the Number of Identified Specimens per Taxon (NISP), the Minimum Number of Individuals (MNI), Minimum Number of Elements (MNE), Minimum Animal Units (MAU), Minimum Animal Unit Percent (%MAU) (reviewed by Lyman) and Meat Cut Ranks and Meat Cut Rank Percents. Meat Cut Rank percents were values derived for this specific study paper and used to reinforce assumed patterning based upon meat cut ranking. These tests helped clarify the negative evidence that may skew any values assigned in meat cut rank, such as boneless cuts of meat or small sample size.

Because of time constraints, taphonomic factors such as degree of weathering, carnivore modification, fragmentation, etc., were not addressed during this study. The intent of the present paper was an understanding of:

1. patterns of frontier processes of subsistence and supply
2. butchering patterns
3. patterns of social status and rank based upon subsistence

RESULTS

NISP

The Number of Identified Specimens based upon *Bos taurus* remains (Figure 10.5) showed a high frequency of ribs for all blocks. Excavation Blocks One and Two showed the highest frequency of ribs (N=20 and 12, respectively) while Excavation Block Four showed the lowest (N=10). Excavation Block One (Table 10.2) showed the highest frequency of cervical vertebrae (N=6), unspecified vertebral elements (N=7), femora (N=8), and innominates (N=6). Excavation Block Two (Table 10.3) showed the highest frequency of thoracic vertebrae (N=5) and neck elements such as

atlas and axis (N=1 and 2, respectively). Excavation Block Four (Table 10.4) showed the highest frequency of lumbar vertebrae (N=6), scapulae (N=3), radius-ulnae (N=6 total), and tibiae (N=3).

NISP FOR MEAT CUT RANKS

The NISP for beef meat cut ranks (lower numeric values represent higher quality retail cuts) was tabulated based on Schulz and Gust's (1983a, 1983b) value ranking system (Figure 10.6). Excavation Block One (Officer's Quarters) (Table 10.5) showed the highest NISP for short plate (N=2), arm (N=1), rumps (N=8), and rounds (N=4), while Excavation Block Two (also Officer's Quarters) (Table 10.6) showed the highest

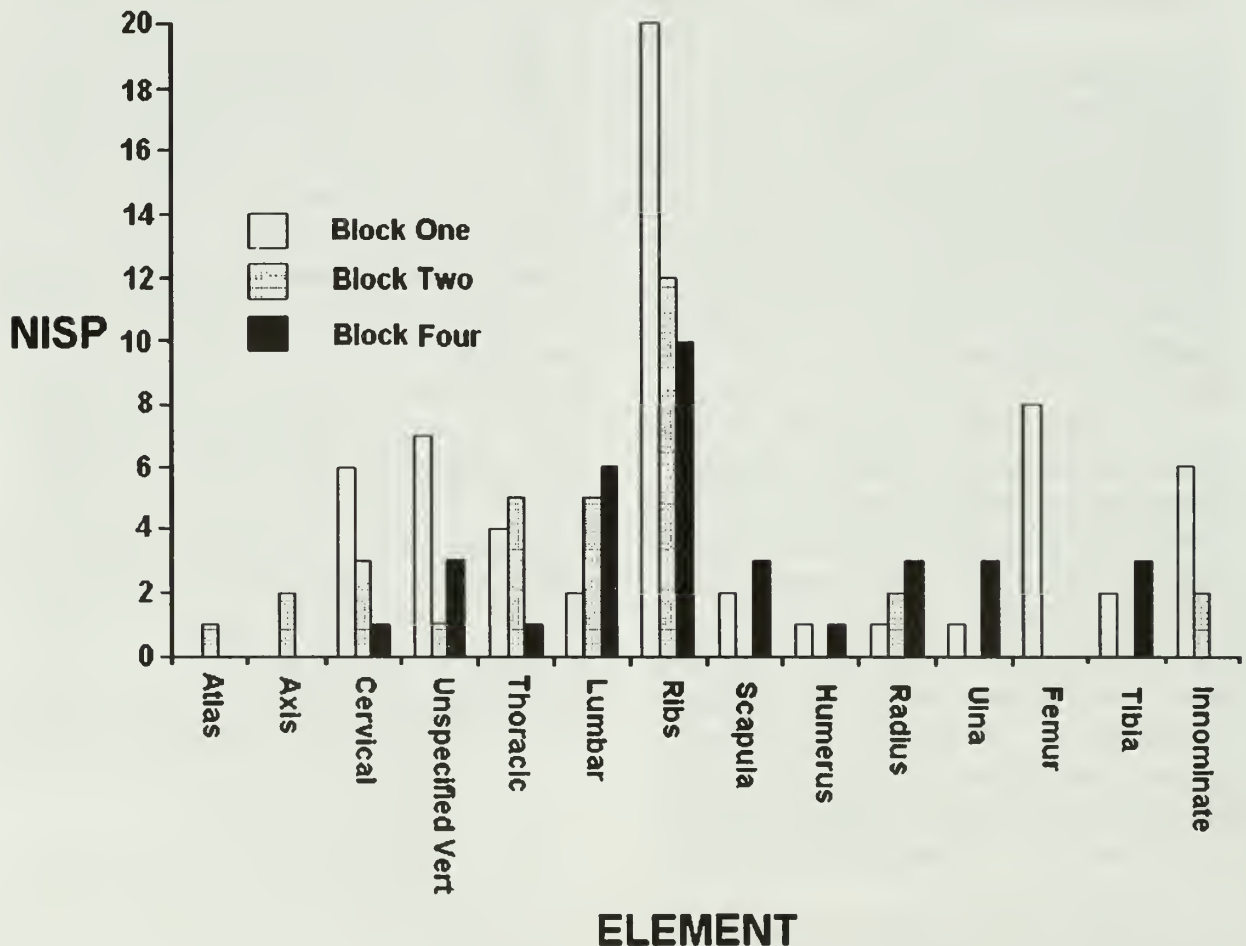


Figure 10.5: NISP For faunal elements from Excavation Blocks One, Two, and Four.

Table 10.2: Frequency of beef skeletal portions, Excavation Block One.

| SKELETAL PART | MNI LEFT | MNI RIGHT | MNI AXIAL | MNI | MNE | MAU | %MAU |
|------------------|-------------|--------------|--------------|-----|-----|------|------|
| Atlas (1) | -- | -- | -- | -- | -- | ---- | ---- |
| Axis (1) | -- | -- | -- | -- | -- | ---- | ---- |
| Cervical (5) | 2 | 4 | -- | 1 | 4 | 0.80 | 32 |
| Thoracic (13) | 1 | 3 | -- | 1 | 3 | 0.23 | 9 |
| Lumbar (6) | 1 | 1 | -- | 1 | 1 | 0.17 | 7 |
| Sacrum (1) | 1 | -- | -- | 1 | 1 | 1.00 | 40 |
| Os Coxae (2) | 2 | 1 | -- | 2 | 3 | 1.50 | 60 |
| P Rib (26) | 4 | 3 | -- | 1 | 7 | 0.27 | 11 |
| Scapula (2) | 1 | 1 | -- | 1 | 2 | 1.00 | 40 |
| P Humerus (2) | -- | -- | -- | -- | -- | ---- | ---- |
| D Humerus (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Radius (2) | 1 | -- | -- | 1 | 1 | 0.50 | 20 |
| D Radius (2) | -- | -- | -- | -- | -- | ---- | ---- |
| Carpals (12) | -- | -- | -- | -- | -- | ---- | ---- |
| P Metacarpal (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Femur (2) | 3 | 2 | -- | 3 | 5 | 2.50 | 100 |
| D Femur (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Tibia (2) | 1 | -- | -- | 1 | 1 | 0.50 | 20 |
| D Tibia (2) | -- | 1 | -- | 1 | 1 | 0.50 | 20 |
| Astragalus (2) | -- | -- | -- | -- | -- | ---- | ---- |
| Calcaneum (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Metatarsal | -- | -- | -- | -- | -- | ---- | ---- |

Table 10.5: Beef cut frequencies, Excavation Block One.

| CUT | NUMBER | PERCENTAGE |
|---------------|--------|------------|
| Hindshank | 4 | 8.7 |
| Foreshank | 2 | 4.3 |
| Neck | 6 | 13 |
| Short Plate | 2 | 4.3 |
| Cross & Short | 2 | 4.3 |
| Chuck | 5 | 10.9 |
| Rump | 8 | 17.4 |
| Round | 4 | 8.7 |
| Sirloin | 3 | 6.5 |
| Rib | 7 | 15.2 |
| Short Loin | 2 | 4.3 |
| Total | 46 | 99.8 |

for short and cross ribs (N=5), ribs (N=9), and short loin (N=9). Excavation Block Four (Table 10.7) showed the highest frequencies of hindshanks (N=5), foreshanks (N=8), and chucks (N=7).

CUMULATIVE PERCENT BEEF CUT RANKS

Cumulative percent for beef cut ranks (Figure 10.7) (Tables 10.8-10.10) were tabulated for comparison to Schulz and Gust's (1983a) cumulative percents of late nineteenth century faunal remains from the Golden Eagle Hotel, Sacramento, California and the Sacramento, California City Jail. As one might expect, the Golden Eagle Hotel shows the highest frequency

Table 10.3: Frequency of beef skeletal portions, Excavation Block Two.

| SKELETAL PART | MNI LEFT | MNI RIGHT | MNI AXIAL | MNI | MNE | MAU | %MAU |
|------------------|-------------|--------------|--------------|-----|-----|------|------|
| Atlas (1) | -- | 1 | -- | 1 | 1 | 1 | 100 |
| Axis (1) | 1 | 1 | -- | 1 | 1 | 1 | 100 |
| Cervical (5) | 1 | 2 | -- | 1 | 2 | 0.40 | 40 |
| Thoracic (13) | -- | 4 | 1 | 1 | 5 | 0.38 | 38 |
| Lumbar (6) | 2 | 4 | -- | 1 | 4 | 0.67 | 67 |
| Sacrum (1) | -- | -- | -- | -- | -- | ---- | ---- |
| Os Coxae (2) | 1 | -- | -- | 1 | 1 | 0.50 | 50 |
| P Rib (26) | 2 | 1 | -- | 1 | 3 | 0.12 | 12 |
| Scapula (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Humerus (2) | -- | -- | -- | -- | -- | ---- | ---- |
| D Humerus (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Radius (2) | -- | 1 | -- | 1 | 1 | 0.50 | 50 |
| D Radius (2) | 1 | -- | -- | 1 | 1 | 0.50 | 50 |
| Carpals (12) | 2 | -- | -- | 1 | 2 | 0.17 | 17 |
| P Metacarpal (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Femur (2) | -- | -- | -- | -- | -- | ---- | ---- |
| D Femur (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Tibia (2) | -- | -- | -- | -- | -- | ---- | ---- |
| D Tibia (2) | -- | -- | -- | -- | -- | ---- | ---- |
| Astragalus (2) | -- | 1 | -- | 1 | 1 | 0.50 | 50 |
| Calcaneum (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Metatarsal | -- | -- | -- | -- | -- | ---- | ---- |

Table 10.6: Beef cut frequencies, Excavation Block Two.

| CUT | NUMBER | PERCENTAGE |
|---------------|--------|------------|
| Hindshank | 1 | 3.1 |
| Foreshank | 2 | 6.3 |
| Neck | 6 | 18.8 |
| Short Plate | 1 | 3.1 |
| Cross & Short | 5 | 15.6 |
| Chuck | 1 | 3.1 |
| Rump | 1 | 3.1 |
| Round | -- | ---- |
| Sirloin | 1 | 3.1 |
| Rib | 9 | 28.1 |
| Short Loin | 5 | 15.6 |
| Total | 32 | 99.9 |

of higher value meat cuts due to the higher social status of individuals eating there, such as steaks, round steaks, and sirloins; typical high quality cuts of meat. Both Excavation Blocks One and Two (Officers Quarters) correlate closely to the frequency represented at the Golden Eagle Hotel. Excavation Block Four, on the other hand, closely resembles the patterning for the Sacramento City Jail. This reflects lower quality but higher yield meat cuts such as foreshanks, hindshanks, necks, plates, and ribs. These meat cuts would represent more and larger cuts for roasting and stewing for feeding many people.

Table 10.4: Frequency of beef skeletal portions, Excavation Block Four.

| SKELETAL PART | MNI LEFT | MNI RIGHT | MNI AXIAL | MNI | MNE | MAU | %MAU |
|------------------|-------------|--------------|--------------|-----|-----|------|------|
| Atlas (1) | -- | -- | -- | -- | -- | ---- | ---- |
| Axis (1) | -- | -- | -- | -- | -- | ---- | ---- |
| Cervical (5) | 1 | -- | -- | 1 | 1 | 0.20 | 13 |
| Thoracic (13) | -- | -- | 1 | 1 | 1 | 0.08 | 5 |
| Lumbar (6) | 3 | 2 | -- | 1 | 3 | 0.50 | 33 |
| Sacrum (1) | -- | -- | -- | -- | -- | ---- | ---- |
| Os Coxae (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Rib (26) | 2 | 1 | -- | 1 | 3 | 0.12 | 8 |
| Scapula (2) | 1 | 2 | -- | 2 | 3 | 1.50 | 10 |
| P Humerus (2) | -- | -- | -- | -- | -- | ---- | ---- |
| D Humerus (2) | -- | 1 | -- | 1 | 1 | 0.50 | 33 |
| P Radius (2) | 2 | 1 | -- | 2 | 3 | 1.50 | 10 |
| D Radius (2) | -- | -- | -- | -- | -- | ---- | ---- |
| Carpals (12) | 1 | -- | -- | 1 | 1 | 0.80 | 5 |
| P Metacarpal (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Femur (2) | -- | -- | -- | -- | -- | ---- | ---- |
| D Femur (2) | -- | -- | -- | -- | -- | ---- | ---- |
| P Tibia (2) | 2 | -- | -- | 2 | 2 | 1.00 | 67 |
| D Tibia (2) | 1 | -- | -- | 1 | 1 | 0.50 | 33 |
| Astragalus (2) | -- | 1 | -- | 1 | 1 | 0.50 | 33 |
| Calcaneum (2) | -- | 1 | -- | 1 | 1 | 0.50 | 33 |
| P Metatarsal | -- | -- | -- | -- | -- | ---- | ---- |

Table 10.7: Beef cut frequencies, Excavation Block Four.

| CUT | NUMBER | PERCENTAGE |
|---------------|--------|------------|
| Hindshank | 5 | 16.7 |
| Foreshank | 8 | 26.7 |
| Neck | -- | ---- |
| Short Plate | -- | ---- |
| Cross & Short | -- | ---- |
| Chuck | 7 | 23.3 |
| Rump | -- | ---- |
| Round | -- | ---- |
| Sirloin | 3 | 10.0 |
| Rib | 3 | 10.0 |
| Short Loin | 4 | 13.3 |
| Total | 30 | 100.0 |

MEAT CUT RANK VALUE PERCENTS

For comparative purposes, the meat cut rank value was converted into a standardized value by multiplying the number of cuts (N) for each rank value (R) which gave a ranked value (RxN) that was then standardized by dividing by the greatest tabulated ranked value. This method is modeled after Binford's (1978) %MAU's standardization process to factor out problems because of sample size. Both Excavation Blocks One and Two show similar percentage patterns peaking at or near equal meat cut ranks such as the foreshank (Rank 9), neck (Rank 8), cross and short ribs (Rank 6), and ribs (Rank 2). This pattern is difficult to interpret. This

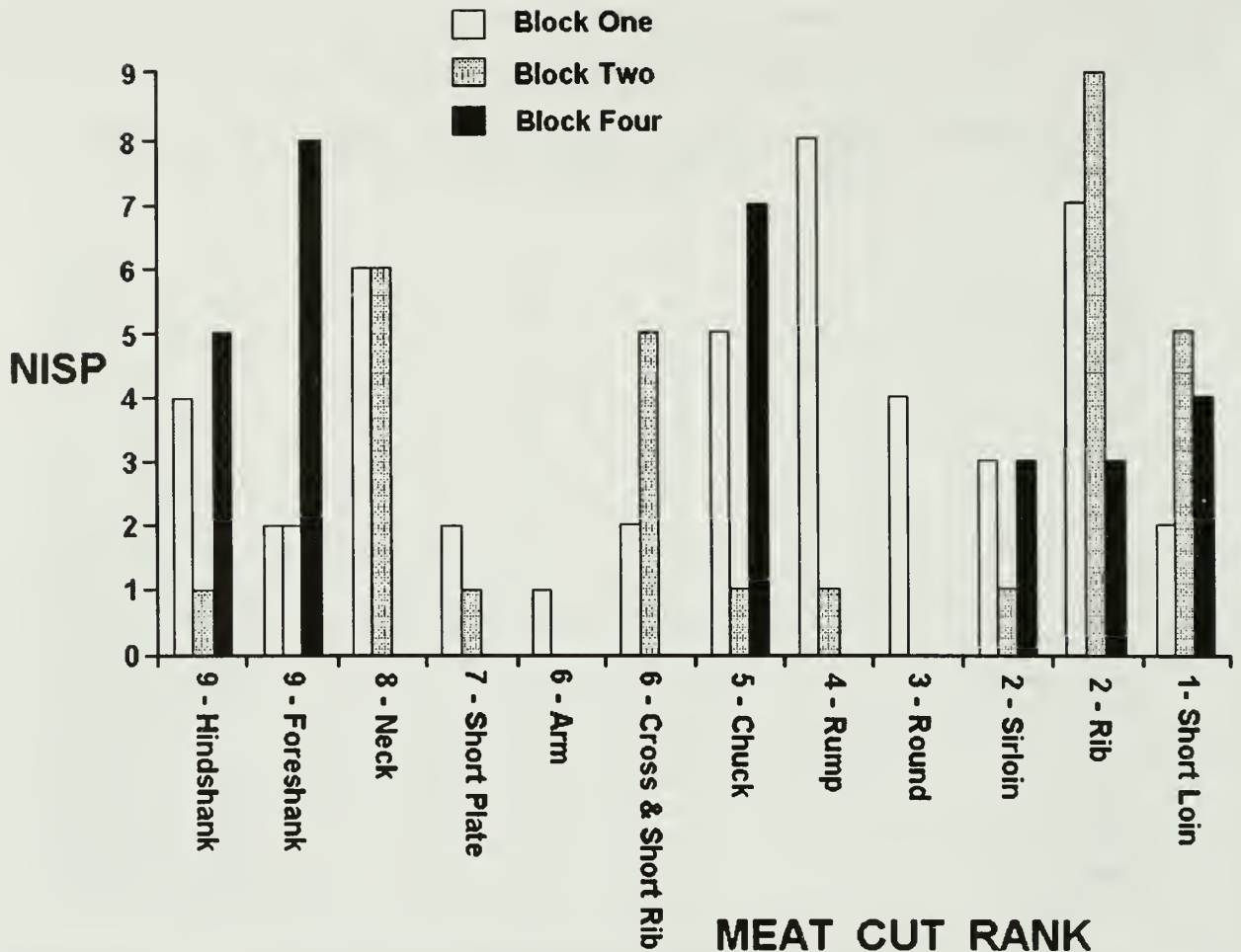


Figure 10.6: NISP for beef meat cut ranks (lower values represent higher quality meat cuts).

could reflect similar divisions of beef cut halves for Officers in both blocks with some soup-type cuts being allocated such as neck bones and foreshanks. Excavation Block Four (Figure 10.8) has the highest percentage in the foreshanks (Rank 9), with peaks in the hindshank (Rank 9), and chuck (Rank 5).
% MAU

%MAU was tabulated as defined by Lyman (1994) for comparative purposes (Figure 10.9). Elements of the axial skeleton posed a particular problem when trying to tabulate MNIs and MNEs because of butchering these elements into beef halves. This was resolved by noting the number of left and right halves based on centra when possi-

ble, then taking the larger of the two MNI values for calculation of the % MAU. Excavation Block Two showed the highest percentages of axial elements, while Excavation Block One was similar in peak percentages for the same elements. Excavation Block Four showed a lower percentages for axial elements while showing peaks for lower limb elements.

TYPICAL MEAT CUT TYPE FOR BLOCKS

The evidence for meat cuts represented by faunal remains from each block becomes evident when the actual cuts, represented by butchering patterns, were identified. T-bone steak cuts, sirloin cuts, round steak cuts, and

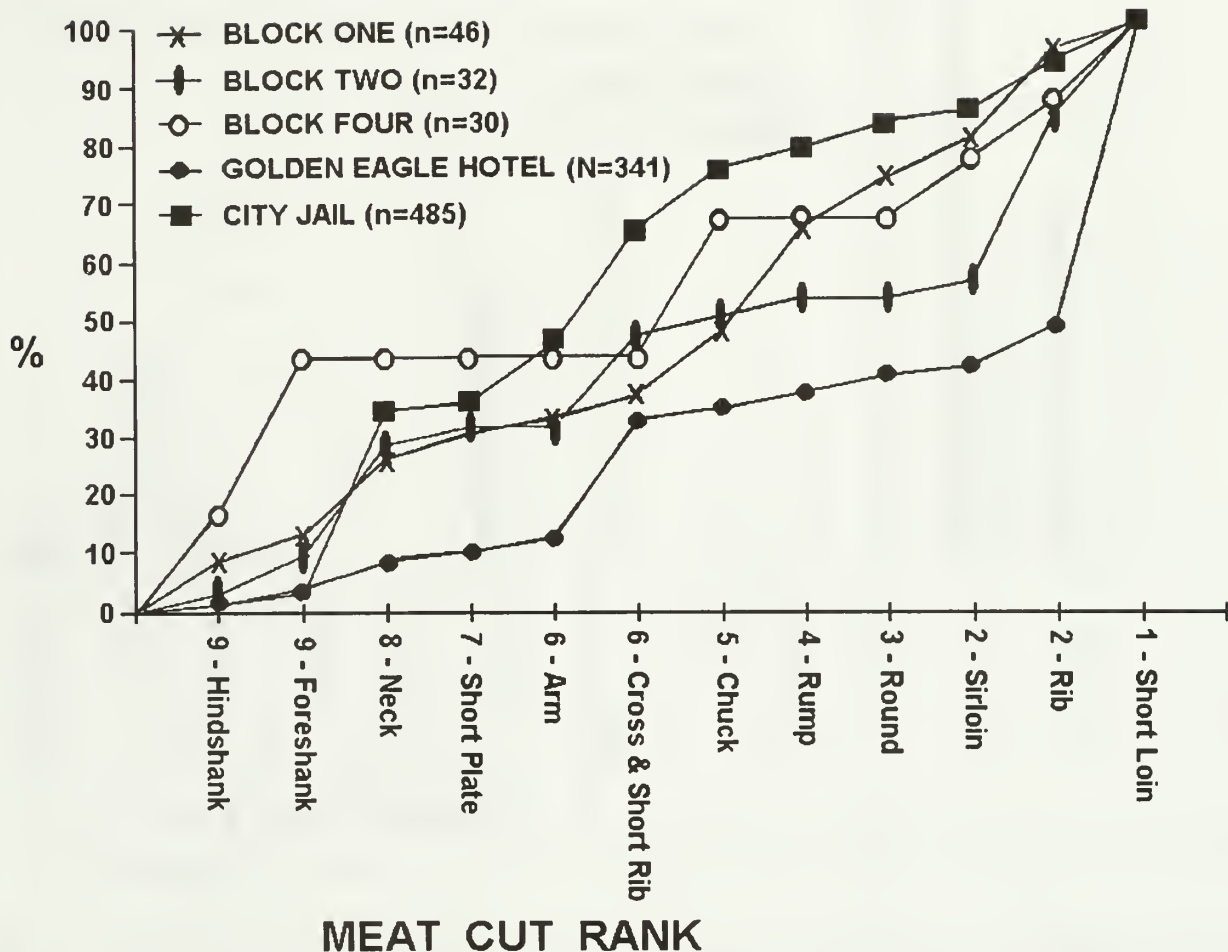


Figure 10.7: Cumulative percent of Excavation Blocks One, Two, and Four compared to Golden Eagle Hotel and Sacramento City Jail.

rump cuts were recovered from Excavation Block One. All these cuts rank among the higher value cuts in butchering a beef halve.

Excavation Block Two like Excavation Block One, shows the same butchering pattern with evidence of rumps, T-bone steaks, round steaks, and rib steaks. Excavation Block Four on the other hand, shows clear evidence of lower quality meat cuts such as stew and soup cuts as well as larger overall portions of elements indicative of roasts.

WILD GAME AND DOMESTICATED BIRD PROCUREMENT AT FORT LARAMIE

As discussed above, food supply to Fort Laramie is an important part of the analysis of the artifact materials from the Quartermaster Dump Project. An original consideration of this analysis was that the occupants of Fort Laramie were supplementing their domestic diet with local wild game. Supposedly, "hunting and fishing were a favorite pastime in the frontier military" (Crass and Walsmith 1993). Therefore, it was originally assumed for this study that soldiers would be hunting around the fort and the

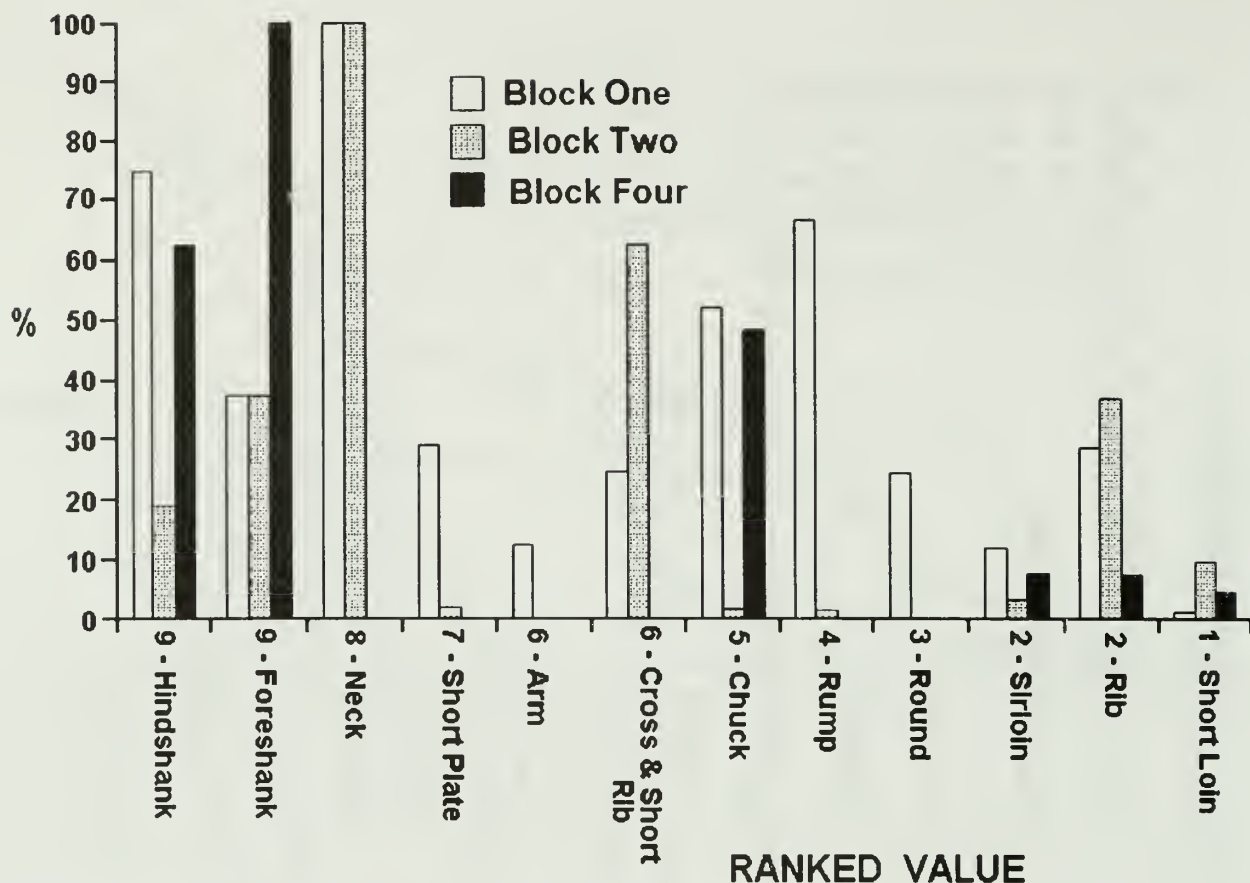


Figure 10.8: Standardized meat cut rank value percentages, Excavation Blocks One, Two, and Four.

faunal materials recovered from the Quartermaster Dump could include a reasonable cross-section of the local fauna. However, this preliminary analysis of the fauna shows few specimens of wild species were present (Tables A2.38-A2.45). The soldiers may not have been allowed to hunt, or as discussed above, there were no wild game animals left near the fort in the 1880s. The fort Laramie Quartermaster Dump faunal assemblage does not correlate with the extant wild fauna of the region.

This is similar to faunal materials from other western historical sites where most, if not all, of the faunal materials consist entirely of cow, bison, or other large mammals (Guilday 1970; Herskovits 1978; Price 1985; Rockman 1995). There is usually no men-

tion of avian or other small fauna, and if there is, these usually are nothing more than a general count of bones (e.g., Crass and Wallsmith 1992; Rothschild and Balkwill 1993; Schulz and Gust 1983a, 1983b). Avian bone counts are almost never broken discussed by element. There is also often little or no mention of non-domesticated food animals in the historic faunal literature. If discussed, it is usually similar to the avian faunal discussion.

Faunal material analyzed from Excavation Blocks One, Two and Four show little evidence of non-domestic faunal remains (Table 10.11). A single femur identified as deer (*Odocoileus* sp.) was recovered from Excavation Block One. The officers (as did the enlisted men) probably considered some

Table 10.8: Beef cut ranks, Excavation Block One.

| CUT | RANK (R) | NUMBER (N) | RANKED VALUE (R×N) | RANKED VALUE PERCENTAGE |
|-------------------|-------------|---------------|-----------------------|----------------------------|
| Hindshank | 9 | 4 | 36 | 75.0 |
| Foreshank | 9 | 2 | 18 | 37.5 |
| Neck | 8 | 6 | 48 | 100.0 |
| Short Plate | 7 | 2 | 14 | 29.2 |
| Arm | 6 | 1 | 6 | 12.5 |
| Cross & Short Rib | 6 | 2 | 12 | 25.0 |
| Chuck | 5 | 5 | 25 | 52.1 |
| Rump | 4 | 8 | 32 | 66.7 |
| Round | 3 | 4 | 12 | 25.0 |
| Sirloin | 2 | 3 | 6 | 12.5 |
| Rib | 2 | 7 | 14 | 29.2 |
| Short Loin | 1 | 2 | 2 | 2.1 |
| Total | 62 | 46 | 225 | |

Average Rank = $(R \times N) / N = 4.89$

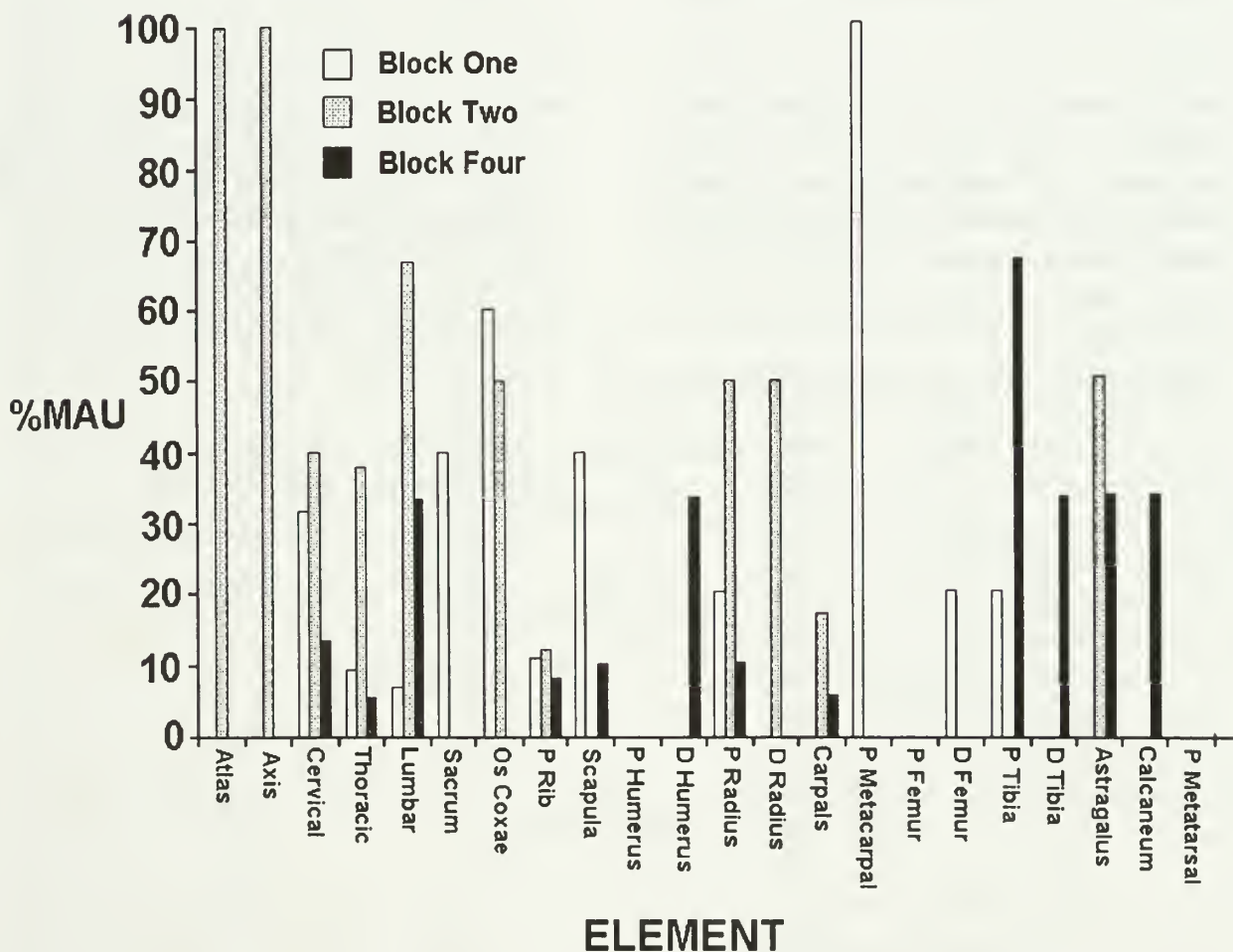


Figure 10.9: %MAU for recovered elements, Excavation Blocks One, Two, and Four.

Table 10.9: Beef cut ranks, Excavation Block Two.

| CUT | RANK (R) | NUMBER (N) | RANKED VALUE (RxN) | RANKED VALUE PERCENTAGE |
|---------------------------------|-------------|---------------|-----------------------|----------------------------|
| Hindshank | 9 | 1 | 96 | 18.8 |
| Foreshank | 9 | 2 | 18 | 37.5 |
| Neck | 8 | 6 | 48 | 100.0 |
| Short Plate | 7 | 1 | 74 | 2.1 |
| Arm | 6 | -- | -- | ---- |
| Cross & Short Rib | 6 | 5 | 30 | 62.5 |
| Chuck | 5 | 1 | 55 | 2.1 |
| Rump | 4 | 1 | 42 | 2.1 |
| Round | 3 | -- | -- | ---- |
| Sirloin | 2 | 1 | 2 | 4.2 |
| Rib | 2 | 9 | 18 | 10.4 |
| Short Loin | 1 | 5 | 5 | 10.4 |
| Total | 53 | 32 | 146 | |
| Average Rank = $(RxN)/N = 4.56$ | | | | |

thing besides beef, pork, or mutton to be a delicacy, and did their best to obtain some any time. A limited amount of turtle and canid bones was also recovered from these block excavation areas. It is likely the canid

was not a food source, and the aquatic turtles may or may not have been eaten (Price 1985). While Price (1985) documented occupants of historic sites often ate turtles, there is no butchery evidence on the Quar

Table 10.10: Beef cut ranks, Excavation Block Four.

| CUT | RANK (R) | NUMBER (N) | RANKED VALUE (RxN) | RANKED VALUE PERCENTAGE |
|---------------------------------|-------------|---------------|-----------------------|----------------------------|
| Hindshank | 9 | 5 | 45 | 62.5 |
| Foreshank | 9 | 8 | 72 | 100.0 |
| Neck | 8 | -- | -- | ---- |
| Short Plate | 7 | -- | -- | ---- |
| Arm | 6 | -- | -- | ---- |
| Cross & Short Rib | 6 | -- | -- | ---- |
| Chuck | 5 | 7 | 35 | 48.6 |
| Rump | 4 | -- | -- | ---- |
| Round | 3 | -- | -- | ---- |
| Sirloin | 2 | 3 | 6 | 8.3 |
| Rib | 2 | 3 | 64 | 8.3 |
| Short Loin | 1 | 4 | 4 | 5.6 |
| Total | 28 | 30 | 168 | |
| Average Rank = $(RxN)/N = 5.60$ | | | | |

Table 10.11: Comparisons of NISP values for various historic sites.

| TAXON | FORT LARAMIE | FORT BOWIE | SOUTH PASS CITY | FORT BURGWIN | NYC/ MANHATTAN | FORT FRED STEELE | FORT LIGONIER | WIDOW HARRIS | MONTICELLO |
|-----------|-----------------|---------------|-----------------------|-----------------|-------------------|------------------------|------------------|-----------------|------------|
| Chicken | 155 | 66 | 133 | 10 | 1219 | 0 | 127 | 145 | 0 |
| Fish | 182 | 2 | 40 | 2 | 1,000 | 0 | 105 | 38 | 5 |
| Turkey | 4 | 6 | 8 | 0 | 196 | 0 | 72 | 29 | 0 |
| Canid | 4 | 0 | 9 | 20 | 27 | 1 | 2 | 4 | 0 |
| Turtle | 9 | 0 | 0 | 0 | 21 | 0 | 6 | 15 | 1 |
| Rodent | 20 | 0 | 11 | 24 | 8 | 1 | 0 | 91 | 0 |
| Duck | 0 | 6 | 0 | 0 | 29 | 0 | 2 | 0 | 0 |
| Geese | 0 | 0 | 9 | 0 | 46 | 0 | 0 | 0 | 0 |
| Pronghorn | 0 | 0 | 13 | 1 | 0 | 4 | 0 | 0 | 0 |
| Elk | 0 | 0 | 34 | 58 | 0 | 0 | 0 | 0 | 0 |
| Bison | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mtn Sheep | 0 | 0 | 3 | 224 | 0 | 0 | 0 | 0 | 0 |
| Grouse | 1 | 0 | 0 | 0 | 6 | 0 | 1 | 1 | 0 |
| Bear | 0 | 0 | 0 | 0 | 0 | 0 | 78 | 0 | 0 |
| Bird | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 112 |

termaster Dump turtle bones to suggest this was the case at Fort Laramie. The turtles may be a natural occurrence on the site surface, and not related to the military occupation at all. Several species are extant in the region today (Baxter and Stone 1980).

Most of the non-cow, non-pig, and non-sheep (i.e., larger domestic animals) from the Fort Laramie Quartermaster Dump Project were fish and chicken (Figure 10.13). Such remains from Excavation Block One are

shown to be dominated by fish remains, while the non-large domestic fauna from Excavation Blocks Two, Four, and Seven is mostly chicken. Little information is available on fishing by military personnel at Fort Laramie, although fish would have been present throughout the occupation of the fort in both the Laramie and North Platte Rivers.

The various excavation blocks also exhibit marked differences in the leg and wing bone distributions for domestic chicken.

Excavation Block Four, felt to be related to enlisted men's trash, contain more leg and wing bones than the other blocks (Table 10.12). This pattern might be expected because there would be more enlisted men than officers. If chickens were being consumed relatively between the two social classes, more chicken legs and wings would be present in an enlisted men's dump. More people equals more consumption despite the food class.

While probably a problem with sampling, slightly more right side chicken bones were recovered from

Table 10.12: NISP values for "leg" and "wing" bones of domestic chicken by excavation block.

| BLOCK | FEMUR | FIBULA | TIBIO- TARSUS | TARSO- METATARSUS |
|-------|---------|--------|------------------|----------------------|
| 1 | 1 | 2 | 1 | 1 |
| 2 | 4 | 0 | 5 | 3 |
| 4 | 1 | 0 | 3 | 7 |
| 7 | 0 | 0 | 1 | 0 |
| BLOCK | HUMERUS | RADIUS | ULNA | CARPO- METACARPUS |
| 1 | 0 | 2 | 0 | 1 |
| 2 | 5 | 1 | 3 | 0 |
| 4 | 7 | 3 | 2 | 0 |
| 7 | 2 | 0 | 0 | 0 |

all excavation blocks than similar bones from the left side. Over the entire assemblage, there are only small differences between the left and right sides. This is more obvious when examining each excavation block (Table 10.13). These figures are not significant enough however, to make generalizations about butchering or supply strategies concerning "halves" of chickens.

As discussed earlier, the non-large domestic animal fauna from the Fort Laramie Quartermaster Dump shows patterns that are not apparent elsewhere. A small sample of faunal remains from Fort Fred Steele, Wyoming (Sam Drucker, personal communication 1996) contains no chicken bones, but several deer and pronghorn elements. Fort Ligonier, Pennsylvania, has close to the same number of chicken bones, but significantly more turkey, deer, and bear bones (Guilday 1970). Basically, faunal remains from the Fort Laramie Quartermaster Dump may reflect the over-hunting of the local fauna in earlier years. Had there been more native fauna in the region, there likely would be more represented in the assemblage.

CONCLUSIONS

This preliminary investigation of the faunal remains from Excavation Blocks One, Two and Four at the Fort Laramie Quartermaster Dump Project shows distinctive patterns of supply and subsistence and indications of rank typical of Western forts in the late 19th century (Herskovitz 1978). Those processes (supply, subsistence, and rank) were examined through the faunal remains, and by using historical documentation to infer and interpret expected patterns in the faunal assemblage based upon distinctively structured methods of supply and subsistence in the 19th Century military. The results of the paper indicate the offi-

Table 10.13: Comparison of chicken right and left NISP counts.

| ELEMENT | LEFT | RIGHT |
|-----------------|------|-------|
| BLOCK ONE | | |
| Radius | 2 | 0 |
| Scapula | 0 | 1 |
| Femur | 0 | 1 |
| Tibiotarsus | 0 | 1 |
| Fibula | 0 | 2 |
| Innominate | 1 | 0 |
| Carpometacarpus | 1 | 0 |
| Tarsometatarsus | 0 | 1 |
| Coracoid | 0 | 1 |
| BLOCK TWO | | |
| Femur | 0 | 4 |
| Tarsometatarsus | 0 | 3 |
| Scapula | 3 | 0 |
| Radius | 1 | 0 |
| Humerus | 2 | 3 |
| Carpometacarpus | 2 | 2 |
| Ulna | 3 | 0 |
| Tibiotarsus | 2 | 3 |
| Furculum | 1 | 0 |
| BLOCK FOUR | | |
| Tarsometatarsus | 4 | 3 |
| Humerus | 1 | 6 |
| Coracoid | 0 | 1 |
| Scapula | 1 | 0 |
| Radius | 0 | 3 |
| Ulna | 2 | 0 |
| Tibiotarsus | 3 | 0 |
| Femur | 1 | 0 |
| BLOCK SEVEN | | |
| Humerus | 0 | 2 |
| Tibiotarsus | 0 | 1 |
| TOTAL | | |
| Radius | 3 | 3 |
| Scapula | 4 | 1 |
| Femur | 1 | 5 |
| Tibiotarsus | 5 | 5 |
| Fibula | 0 | 2 |
| Innominate | 1 | 0 |
| Carpometacarpus | 1 | 0 |
| Tarsometatarsus | 4 | 7 |
| Coracoid | 2 | 4 |
| Humerus | 3 | 11 |
| Ulna | 5 | 0 |
| Furculum | 1 | 0 |

cers at Fort Laramie, particularly as evidenced by remains recovered from Excavation Blocks One and Two, were eating

higher quality beef meat cuts than the enlisted men, represented by materials recovered from Excavation Block Four. Using beef cut ranks based on late nineteenth century retail values, the evidence suggests the Officer's dumps (Excavation Blocks One and Two) had a higher percentage of higher ranked meat cuts than the Enlisted Men's Dump (Block Four).

The meat ranking system used in this study was felt to be innovative as a research tool and, along with the sketching of the beef cuts, resulted in a system where one knew exactly what was being recorded. One main problem with the study was the amount of time involved in identifying exactly where a butchered element originated on the carcass.

Besides this difference in meat ranks between officers and enlisted men, other evidence is also present suggesting the officers were eating better. First, officers at the fort often had a female cook and their own personal kitchen facilities (Anthony 1930) whereas enlisted men usually rotated meal preparation responsibilities within their ranks. Unfortunately, most enlisted men lacked training and even fewer had any culinary talent (Caperton and Fry 1974). Differences in meal preparation and facilities in which to work contributed to a variance in food quality. Officers were also better able to purchase extra food materials from the Sutler's store, allowing them to increase and enhance their rations. It was also not uncommon for military forts of the 1800s to use gardens to improve diets (Caperton and Fry 1974; Luecke 1990). A General Department Order of 1818 also required forts to provide subsistence through farming (Luecke 1990). This order was issued to increase the quality of the military diet, but also was made mandatory

to increase the self-sufficiency of the fort. During periods of unstable relations with Native Americans, it was necessary to make the outposts as self reliant as possible to decrease their vulnerability if they were cut off from supply shipments. This is also why many forts, including Fort Laramie (Hendron 1941) had established butchery houses.

These houses helped the forts in maintaining their independence without decreasing their dietary content. It has been documented that Fort Laramie received cattle for slaughter from herds being trailed through or cattle being pastured near the fort (Jesup 1857). As discussed above based on the faunal remains, halving of beef carcasses was taking place at the fort. Therefore, some type of beef herd must have been maintained locally, because transport refrigeration on a large scale was not available during the 1880s.

CHAPTER 11

ARTIFACT DISTRIBUTIONAL ANALYSIS

by
Danny N. Walker

As with any archeological excavations at a historic dump feature, a wide variety of artifacts were recovered from the 1994 excavations at the Fort Laramie Quartermaster Dump Project. These ranged from items such as complete and broken bottles, uniform parts and insignia, household items, metal cans to fragmented metal (usually from cans or barrel hoops) and a complete iron safe door. Complete listings of all cataloged artifacts recovered during the various phases of the project is on file at Fort Laramie National Historic Site and the University of Wyoming, Department of Anthropology Archaeological Repository.

As mentioned several times previously, all datable items from all excavation blocks except Excavation Block Five were assigned

an age to the 1880s. This was especially so for datable items from Excavation Blocks One to Four. Some bottles from Excavation Block five suggest part of that dump feature represents items manufactured in the 1890s, as well as military and other items from the 1880s. In general, the artifact assemblage can then be characterized as "typical" of an 1880s military post, where artifacts representing both military and civilian use were curated.

Spatial distribution of artifacts from the project area are presented elsewhere (Maps 1-6, Figure 8.21, lower). These distributions (Tables 11.1-11.16) show distinct clustering of artifacts that represent individual episodes of dumping along the river bank. However, artifact classes defined by the

Table 11.1: Metal artifact distributions by block excavation area.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|--------|-----------|----------------------|-----------------------|
| 1 | 25 | 8,286 | 12,673.4 | 331.44 | 506.94 |
| 2 | 21 | 7,441 | 12,983.3 | 354.33 | 618.25 |
| 3 | 19 | 4,750 | 12,068.5 | 250.00 | 635.18 |
| 4 | 15 | 41,328 | 76,643.8 | 2,755.20 | 5,109.59 |
| 5 | 20 | 32,213 | 101,316.1 | 1,610.65 | 5,065.81 |
| 6 | 3 | 383 | 1,540.7 | 127.67 | 513.57 |
| 7 | 8 | 478 | 5,582.9 | 59.75 | 697.86 |
| 8 | na | 1,484 | 19,323.2 | na | na |
| Total | 111 | 96,363 | 242,131.9 | 868.14 | 2,181.37 |

Table 11.2: Glass artifact distributions by block excavation area.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|--------|-----------|----------------------|-----------------------|
| 1 | 25 | 5,234 | 21,341.6 | 209.36 | 853.66 |
| 2 | 21 | 5,794 | 15,947.8 | 275.90 | 759.42 |
| 3 | 19 | 14,837 | 30,036.0 | 780.89 | 1,580.84 |
| 4 | 15 | 4,468 | 14,049.8 | 297.87 | 936.65 |
| 5 | 20 | 1,684 | 16,784.0 | 84.20 | 839.20 |
| 6 | 3 | 946 | 2,662.0 | 315.33 | 887.33 |
| 7 | 8 | 21 | 62.5 | 2.63 | 7.81 |
| 8 | na | 1,853 | 9,040.5 | na | na |
| Total | 111 | 34,837 | 109,924.2 | 313.85 | 990.31 |

Table 11.3: Masonry artifact distributions by block excavation .

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|----------|----------------------|-----------------------|
| 1 | 25 | 1,256 | 3,253.9 | 50.24 | 130.16 |
| 2 | 21 | 137 | 424.8 | 6.52 | 20.23 |
| 3 | 19 | 382 | 2,750.6 | 20.11 | 144.77 |
| 4 | 15 | 601 | 10,959.8 | 31.64 | 730.65 |
| 5 | 20 | 222 | 6,849.9 | 11.10 | 342.50 |
| 6 | 3 | 10 | 544.9 | 3.33 | 181.63 |
| 7 | 8 | 7 | 74.5 | 0.88 | 9.31 |
| 8 | na | 74 | 7,962.3 | na | na |
| Total | 111 | 2,689 | 32,820.7 | 24.23 | 295.68 |

Table 11.4: Faunal remains distributions by block excavation area.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|----------|----------------------|-----------------------|
| 1 | 25 | 1,287 | 5,701.3 | 51.48 | 228.05 |
| 2 | 21 | 787 | 2,141.2 | 37.48 | 101.96 |
| 3 | 19 | 2,246 | 4,934.5 | 118.21 | 259.71 |
| 4 | 15 | 712 | 2,382.2 | 47.47 | 158.81 |
| 5 | 20 | 638 | 4,675.3 | 31.90 | 233.77 |
| 6 | 3 | 117 | 379.5 | 39.00 | 126.50 |
| 7 | 8 | 547 | 4,351.1 | 68.38 | 543.89 |
| 8 | na | 666 | 4,906.7 | na | na |
| Total | 111 | 7,000 | 29,471.8 | 63.06 | 265.51 |

Table 11.5: Ceramic artifact distributions by block excavation area.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|----------|----------------------|-----------------------|
| 1 | 25 | 1,109 | 6,932.3 | 44.36 | 277.29 |
| 2 | 21 | 3,287 | 4,460.7 | 156.52 | 212.41 |
| 3 | 19 | 332 | 453.4 | 17.47 | 23.86 |
| 4 | 15 | 361 | 948.1 | 24.07 | 63.21 |
| 5 | 20 | 232 | 1,654.1 | 11.60 | 82.71 |
| 6 | 3 | 36 | 65.5 | 12.00 | 21.83 |
| 7 | 8 | 3 | 1.4 | 0.38 | 0.18 |
| 8 | na | 383 | 1,694.3 | na | na |
| Total | 111 | 5,743 | 16,209.8 | 51.74 | 55.94 |

Table 11.6: Wood artifact distributions by block excavation area,.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|---------|----------------------|-----------------------|
| 1 | 25 | 21 | 5.3 | 0.84 | 0.21 |
| 2 | 21 | 271 | 2,618.0 | 12.91 | 124.67 |
| 3 | 19 | 9 | 1,839.8 | 0.47 | 96.83 |
| 4 | 15 | 175 | 1,850.5 | 11.67 | 123.37 |
| 5 | 20 | 550 | 181.2 | 27.50 | 9.06 |
| 6 | 3 | 0 | 0.0 | 0.00 | 0.00 |
| 7 | 8 | 2 | 47.0 | 0.25 | 5.88 |
| 8 | na | 366 | 39.6 | na | na |
| Total | 111 | 1,392 | 6,581.4 | 12.58 | 59.29 |

Table 11.7: Leather artifact distributions by block excavation area,.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|---------|----------------------|-----------------------|
| 1 | 25 | 67 | 123.8 | 2.68 | 4.95 |
| 2 | 21 | 47 | 131.0 | 2.24 | 6.24 |
| 3 | 19 | 27 | 19.4 | 1.42 | 1.02 |
| 4 | 15 | 165 | 1150.4 | 11.00 | 76.69 |
| 5 | 20 | 513 | 2,063.2 | 25.65 | 103.16 |
| 6 | 3 | 3 | 1.3 | 1.00 | 0.43 |
| 7 | 8 | 0 | 0.0 | 0.00 | 0.00 |
| 8 | na | 43 | 99.5 | na | na |
| Total | 111 | 865 | 3,588.6 | 7.79 | 32.33 |

Table 11.8: Plant artifact and material distributions by block excavation area.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|---------|----------------------|-----------------------|
| 1 | 25 | 10 | 2,403.5 | 0.40 | 96.14 |
| 2 | 21 | 30 | 233.2 | 1.43 | 11.10 |
| 3 | 19 | 3 | 0.8 | 0.16 | 0.04 |
| 4 | 15 | 3 | 2.2 | 0.20 | 0.15 |
| 5 | 20 | 0 | 0.0 | 0.00 | 0.00 |
| 6 | 3 | 0 | 0.0 | 0.00 | 0.00 |
| 7 | 8 | 3 | 0.1 | 0.38 | 0.01 |
| 8 | na | 12 | 7.9 | na | na |
| Total | 111 | 58 | 2,647.6 | 0.52 | 23.85 |

Table 11.9: Stone artifact distributions by block excavation area.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|---------|----------------------|-----------------------|
| 1 | 25 | 0 | 0.0 | 0.00 | 0.00 |
| 2 | 21 | 11 | 247.8 | 0.52 | 11.80 |
| 3 | 19 | 56 | 256.4 | 2.95 | 13.49 |
| 4 | 15 | 7 | 967.7 | 0.47 | 64.51 |
| 5 | 20 | 2 | 6.3 | 0.10 | 0.32 |
| 6 | 3 | 0 | 0.0 | 0.00 | 0.00 |
| 7 | 8 | 0 | 0.0 | 0.00 | 0.00 |
| 8 | na | 6 | 38.5 | na | na |
| Total | 111 | 83 | 1,516.7 | 0.75 | 13.66 |

Table 11.10: Mineral artifact distributions by block excavation area.

| BLOCK | AREA(M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|-----------------------|-------|--------|----------------------|-----------------------|
| 1 | 25 | 0 | 0.0 | 0.00 | 0.00 |
| 2 | 21 | 30 | 322.0 | 1.43 | 15.33 |
| 3 | 19 | 6 | 6.3 | 0.32 | 0.33 |
| 4 | 15 | 1 | 1.0 | 0.07 | 0.07 |
| 5 | 20 | 0 | 0.0 | 0.00 | 0.00 |
| 6 | 3 | 0 | 0.0 | 0.00 | 0.00 |
| 7 | 8 | 0 | 0.0 | 0.00 | 0.00 |
| 8 | na | 0 | 0.0 | na | na |
| Total | 111 | 37 | 329.3 | 0.33 | 2.97 |

Table 11.11: Synthetic material artifact distributions by block excavation area.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|--------|----------------------|-----------------------|
| 1 | 25 | 0 | 0.0 | 0.00 | 0.00 |
| 2 | 21 | 1 | 0.2 | 0.05 | 0.01 |
| 3 | 19 | 2 | 1.8 | 0.11 | 0.09 |
| 4 | 15 | 214 | 214.6 | 14.27 | 14.31 |
| 5 | 20 | 3 | 0.8 | 0.15 | 0.04 |
| 6 | 3 | 0 | 0.0 | 0.00 | 0.00 |
| 7 | 8 | 1 | 0.1 | 0.13 | 0.01 |
| 8 | na | 0 | 0.0 | na | na |
| Total | 111 | 220 | 217.5 | 1.98 | 1.96 |

Table 11.12: Lithic artifact distributions by block excavation area.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|--------|----------------------|-----------------------|
| 1 | 25 | 0 | 0.0 | 0.00 | 0.00 |
| 2 | 21 | 2 | 1.2 | 0.10 | 0.06 |
| 3 | 19 | 5 | 19.7 | 0.26 | 1.04 |
| 4 | 15 | 5 | 4.0 | 0.33 | 0.27 |
| 5 | 20 | 1 | 10.6 | 0.05 | 0.53 |
| 6 | 3 | 1 | 2.0 | 0.33 | 0.67 |
| 7 | 8 | 0 | 0.0 | 0.00 | 0.00 |
| 8 | na | 4 | 62.7 | na | na |
| Total | 111 | 17 | 100.2 | 0.15 | 0.90 |

Table 11.13: Cloth artifact distributions by block excavation area,.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|--------|----------------------|-----------------------|
| 1 | 25 | 2 | 1.2 | 0.08 | 0.05 |
| 2 | 21 | 3 | 0.3 | 0.14 | 0.01 |
| 3 | 19 | 0 | 0.0 | 0.00 | 0.00 |
| 4 | 15 | 0 | 0.0 | 0.00 | 0.00 |
| 5 | 20 | 0 | 0.0 | 0.00 | 0.00 |
| 6 | 3 | 0 | 0.0 | 0.00 | 0.00 |
| 7 | 8 | 33 | 6.7 | 4.13 | 0.84 |
| 8 | na | 1 | 51.5 | na | na |
| Total | 111 | 39 | 59.7 | 0.35 | 0.54 |

Table 11.14: Shell artifact distributions by block excavation area.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|--------|----------------------|-----------------------|
| 1 | 25 | 0 | 0.0 | 0.00 | 0.00 |
| 2 | 21 | 24 | 19.5 | 1.14 | 0.93 |
| 3 | 19 | 8 | 4.2 | 0.42 | 0.22 |
| 4 | 15 | 27 | 9.9 | 1.80 | 0.66 |
| 5 | 20 | 0 | 0.0 | 0.00 | 0.00 |
| 6 | 3 | 0 | 0.0 | 0.00 | 0.00 |
| 7 | 8 | 1 | 0.1 | 0.13 | 0.01 |
| 8 | na | 16 | 15.1 | na | na |
| Total | 111 | 75 | 48.7 | 0.68 | 0.44 |

Table 11.15: Paper artifact distributions by block excavation area.

| BLOCK | AREA(M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|-----------------------|-------|--------|----------------------|-----------------------|
| 1 | 25 | 0 | 0.0 | 0.00 | 0.00 |
| 2 | 21 | 0 | 0.0 | 0.00 | 0.00 |
| 3 | 19 | 0 | 0.0 | 0.00 | 0.00 |
| 4 | 15 | 0 | 0.0 | 0.00 | 0.00 |
| 5 | 20 | 0 | 0.0 | 0.00 | 0.00 |
| 6 | 3 | 0 | 0.0 | 0.00 | 0.00 |
| 7 | 8 | 1 | 1.7 | 0.12 | 0.21 |
| 8 | na | 0 | 0.0 | na | na |
| Total | 111 | 1 | 1.7 | 0.00 | 0.02 |

Table 11.16: Animal parts artifact distributions by block excavation area.

| BLOCK | AREA (M ²) | COUNT | WEIGHT | COUNT/M ² | WEIGHT/M ² |
|-------|------------------------|-------|--------|----------------------|-----------------------|
| 1 | 25 | 0 | 0.0 | 0.00 | 0.00 |
| 2 | 21 | 0 | 0.0 | 0.00 | 0.00 |
| 3 | 19 | 0 | 0.0 | 0.00 | 0.00 |
| 4 | 15 | 0 | 0.0 | 0.00 | 0.00 |
| 5 | 20 | 5 | 0.5 | 0.25 | 0.03 |
| 6 | 3 | 0 | 0.0 | 0.00 | 0.00 |
| 7 | 8 | 0 | 0.0 | 0.00 | 0.00 |
| 8 | na | 0 | 0.0 | na | na |
| Total | 111 | 5 | 0.5 | 0.05 | 0.00 |

National Park Service Automated National Catalog System (NPS-ANCS) were not distributed evenly over the excavated block areas. The major categories of artifacts defined by the NPS-ANCS program were used for preparation of those specific tables. Additional breakdown by specific artifact type within these larger groupings is also possible, but was not done here. Data on file at Fort Laramie National Historic Site or the University of Wyoming, Department of Anthropology Archaeological Repository can be used for this further refinement of the artifact classes.

These artifact classes were examined by both count of artifacts ($n=x$) and by weight of those artifacts. Because of the fragmented nature of most of the collection, weight probably is a better measure of abundance within a block (at least it would be generally relative). However, it should be noted (Tables 11.1-11.16) that count does appear to correlate to a certain extent with weight.

Some block areas had a greater amount of material from one artifact class than another. In fact, some excavation blocks often contained little or no materials from an artifact class, but yet were dominate among the excavation blocks in other artifact classes. The tables also reveal exactly how poorly represented some of the artifact classes were in some of the excavation blocks. In fact, some artifact classes were not recorded for several of the excavation blocks at all, showing exactly how rare these artifact classes were in the collection.

This distribution also suggests that discrete dumping episodes from discrete parts of Fort Laramie were occurring. This can be especially seen in the large amounts of spirits and other liquor bottle fragments and related items found in Excavation Block Three (Table 11.2) where field notes report a thick

(four to five cm) layer of broken glass in one area of the excavation block. this is the dump feature postulated to be from a clean out of the Post Sutler's Store.

Similarly, the large count of masonry (Table 11.3) artifacts recovered from Excavation Block One substantiates the field notes on one dump episode being the remnants of some type of construction activity cleanup. The large count and weight of metal from Excavation Block Five is reflective of the large number of metal cans present in that dump feature. This weight for Excavation Block Five metal does not include the weight of the recovered safe door. Examination of the other artifact classes (Tables 11.1-11.16) reveals other similar supporting documentation for what was considered to comprise various dump episodes.

CHAPTER 12

SUMMARY AND CONCLUSIONS

by

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Archeological investigations were conducted at Fort Laramie National Historic Site, Goshen County, Wyoming, in 1994 and 1996 along a portion of the north bank of the Laramie River, just below the main fort area. This portion of the riverbank has been long known, perhaps erroneously, as the "Quartermaster Depot Dump." Investigations were initiated to mitigate the effect of stream bank erosion on archeological resources along the Laramie River in this area of the park. Since before 1984, National Park Service personnel have noted continual erosion and slumping of the riverbank every spring or other high water period. Each time erosion occurred, additional artifacts eroded from the riverbank deposits. Major damage to the dump area occurred during a flood in 1984. Improper bank stabilization at that time increased erosional damage to the riverbank.

The 1994 investigations were the latest in a long series of Fort Laramie archeological investigations that began in 1939, shortly after the property was acquired by the National Park Service. Most of these earlier projects were connected with building foundation stabilization or proposed construction of additional Park Service facilities. Several dump features were identified during these projects, but always in close association to

buildings where the origin of the dump could be readily determined. These dumps also represented discrete periods, usually during the latest occupation of the associated structure. The dump episodes along the riverbank examined during the present study came from several localities throughout the fort. There was also no known record of when these dump episodes occurred.

1994 archeological investigations began with magnetometer and soil resistivity studies. Soil resistance studies were inconclusive in locating military features in that most soil electrical resistance differences across the project area can be attributed to latest 19th and early 20th century homesteading activities. Preliminary examination of the resistance data suggested the south wall of the "Adobe Corral" might lie under a homesteader era irrigation ditch. However, 1996 archeological investigations suggested, if still present, the north wall of the Adobe Corral formed the base of the irrigation ditch. Therefore, no definitive military age foundations or other features could be identified from the data.

Magnetometer data proved more useful in interpreting a historic dump feature than soil resistance data. The normal use of magnetometer data is to ascertain differences in magnetic orientation of soil structures. Such

soil related magnetic anomalies on a historic dump as this are masked by the volume of metallic objects found in the area. However, patterning of metallic objects on a historic dump is as instructive as patterning of magnetic orientation of soil properties.

Distinct clusters of metallic objects were identified and shown to be scattered over the project area. More than twenty of these metallic clusters can be identified along and near the riverbank. Assuming non-metallic objects occur in the same dump episodes, and the chances of an entirely non-metallic dump episode is low, based on the known scatter of metallic objects, these concentrations represent most, if not all, dump locations still extant along the riverbank. At the same time, there should be no major significant artifacts in the areas that are devoid of metallic objects between concentrations.

Systematic eight-inch auger probes placed along the riverbank between the known metallic concentration areas showed this to be the case. Augering next to known concentrations yielded relative high numbers of artifacts. Further away from these magnetometer identified concentrations, augering yielded little or no numbers of artifacts.

A combination of remote sensing studies, such as these magnetometer data, and systematic augering has shown itself to be a valuable pre-excavation tool in identifying areas of archeological concern. Based on these studies, we know where the various dumping episodes were placed, and still can be found, over the riverbank terraces before archeological excavations begin. This can result in a large cost savings for the project. Without this advance knowledge, the archeological crew would have spent most of the summer along the riverbank, digging areas where there were no artifacts or dump episodes. With this advance knowledge,

archeologists can concentrate on areas known to contain significant archeological data. This isn't to say however, that the areas between the metallic concentrations should be ignored. It is just as archeologically significant that there are no artifacts present between dump episodes.

The application of GIS (Geographic Information Systems) to studies of archeological remains at historic sites is also a valid technique to be used before archeological field investigations. If series of maps are available, as for Fort Laramie, these can be compiled and adjusted for mapping error, and then proper location of historic structures can be postulated. Using a single map to identify the location of a structure can result in locational errors of several tens of meters. By overlaying several maps with the same structure and adjusting for error, a more accurate location can be determined. While it may not be exactly where that historic structure was originally located, the probability of its predicted location being more accurate than any one map is higher. Use of this technique in this study was a direct benefit to determining where the Adobe Corral might be preserved.

RESEARCH GOALS

Several specific goals and associated research questions for mitigation of cultural materials in the stream bank stabilization project area were originally proposed for this project (Walker 1994). First, samples of archeological materials related to refuse disposal from the Quartermaster's Depot and other areas of the fort would hopefully be obtained. The second goal was to attempt to reconstruct different aspects of the past life-ways of the fort's occupants during the nineteenth century. Discovering exactly how much of, and where this dump area remains

were intact, was a third goal of the project. The fourth goal for the project was to discover if any portion of the "adobe" corral was still extant, while a fifth goal was to attempt to find out if the 1850s saw mill structure was within the immediate project area and if it could be recognized. Additional research questions that could be addressed were whether any historic structures were present in the area that could still be recognized; was there any evidence for post-1890 occupation in the project area; and what was the nature and extent of any Historic or prehistoric Native American occupation along this stretch of the Laramie river?

Is there a prehistoric or Historic Native American occupation in the project area?

While lithic tools and other debris that could be attributed to Native American manufacture were recovered from several of the test units (see Chapter 11), no evidence was recovered suggesting any long term Native American occupation along this portion of the Laramie River bank, i.e., long enough for features (fire pits, etc.) to be developed. Evidence does exist such occupations were present within a kilometer of the project area (see Chapter 2), along both sides of the river. It is possible the project area may still contain evidence for such Historic or prehistoric Native American camp sites or other occupational areas.

What is the extent of the post-1890 occupation?

Three features distinctly related to post-military occupation were recorded. The earliest of these was the elevated irrigation ditch constructed around the turn of the century that can still be traced on the ground surface. Historical documentation exists for this feature. A concrete headgate for an irrigation lateral ditch leading from this main elevated ditch along the riverbank was docu-

mented archeologically. The construction of this headgate remains undated, but probably from after the 1920s, based on what might be a piece of car fender being used as part of the headgate. The third civilian occupation feature documented during the project was the 1960s plow zone where attempts were made to loot historic bottles from the dump area before its transfer to federal ownership. *Are there any historic structures present in the project area?*

Structural features recorded in 1994 are represented by the section of the wagon yard fence wall in Excavation Block One and the postulated livestock stable area in Excavation Block Seven. Ditches of unknown origin (but Euroamerican) and use were recorded in Excavation Blocks Two and Three. Three features, probably military in origin, were also recorded along Backhoe Trench Two, but not investigated.

Where is the 1851 sawmill?

Following completion of the geophysical remote sensing over the project area, the test excavations and the potential location of the Adobe Corral, we now know the location of the 1851 sawmill was not within the boundaries of the initial project area, but closer to the main fort area itself. Its physical location remains unknown.

Where is the Adobe Corral or Wood Wagon Yard?

Perhaps the most significant finding of the 1994-1996 archeological investigations along the Laramie River was the identification of structural remnants of the "Adobe Corral." Original interpretation of the remote sensing data suggested the Adobe Corral was still extant in the area in its entirety, with its south wall forming the base of the homesteading period irrigation ditch transversing the study area. The first year's (1994) archeological investigations appeared

to support this idea. The base of a wood fence, with two posts, was located in a position consistent with a similar fence shown on 1860s-1870s military maps. Based on additional archeological excavations in 1996, this interpretation was changed. It is now felt the north wall of the Adobe Corral lies under the irrigation ditch, and not the south wall. Based on stream bank differences between 1960 and 1994 aerial photographs, most of the Adobe Corral would have eroded into the Laramie River in the past 20 years, primarily during the 1984 flood. Again, this points out why detailed archeological ground truthing of remote sensing data must be conducted before final interpretations can be made on remote sensing anomalies.

What is the extent of the remaining dump area?

There are only three areas along this part of the riverbank proper where artifacts are still known to be in immediate danger (i.e., within one or two meters of the riverbank) of eroding into the river: west of Excavations Block One, between Excavation Blocks One and Two, and the area around Excavation Blocks Three and Four. However, do *significant* archeological resources and data remain in these three areas and away from the riverbank? Based on the two years of excavations, only remnants of the Excavation Blocks One and Two dump features remain in situ. Artifact distributions at the end of the 1994 investigations along the north side of Excavation Block Three also showed only remnants of that series of dump features remain intact. The north side of Excavation Block Four does still contain a dense concentration of artifact materials, but based on the geomorphology, there is probably less than one or two meters of horizontal extent remaining to these features. Most of the archeological material from the dump epi-

sodes in Excavation Block Five were completely removed during the 1994 field season. A small remnant might exist on the east side of the block area. However, the geophysical data show additional, major dump episodes are still present adjacent to the east side of Excavation Block Five for several meters.

All historic dump features located within Excavation Blocks One, Two, Three and Four along the riverbank in the project area have been adequately, or in some instances completely, tested or excavated. Additional work on these specific features within these excavations blocks is not warranted.

Highly significant to the overall purpose of this study was the finding that major portions of this terrace immediately next to the riverbank do not contain significant archeological deposits. For many years, common thought was the dump was continuous along the entire length of the riverbank in this part of the fort property. We now know the dump deposits are discontinuous, with a large part of the riverbank having no archeological deposits. This is highly important for the mitigation of the riverbank erosion problem.

Can we learn anything about 19th century lifeways?

Twenty-seven features were recorded during the 1994 excavations at the Fort Laramie Quartermaster Dump area. Most of these (17) are individual dump episodes of trash cleanup from the main fort area, representing military (both officers' and enlisted men's) household items and civilian (post sutler's) trade items. Artifacts from these dump episodes date from the 1880s, although portions of at least one dump episode also contains 1890s era artifacts. It must be noted the block excavation areas were known to contain five concentrations of metallic arti-

facts before excavations began. Seventeen dump episodes were identified based on the excavations. This points out that while remote sensing can identify features such as dump episodes, it cannot be fine-tuned enough to separate overlapping dump episodes. Only archeological excavations can do so.

Based on the remote sensing maps, it is possible an additional minimum of twenty dump episodes remain unexcavated within the project area examined by the remote sensing (Figure 4.9). Without excavation, the origins of these dump episodes (i.e., military or civilian) remains unknown. Likewise the depositional period represented by these dump episodes will only be determined by archeological excavations. Also, if the same relationship exists as with the excavated dump episodes, these 20 magnetometer identified dump episodes may represent over 60 individual dumping activities.

Aspects of the 19th Century lifeways that could be determined were as follows. First, a large number of complete and broken liquor bottles were brought to the dump area over the course of the years the dump was in use. It appears this material was originally from both officer's quarters and other areas of the fort, probably the post sutler's area, but also either enlisted men's areas or civilian Quartermaster employees. Second, officers and their families ate different cuts of meat than enlisted men and civilian employees. By inference, it can then be assumed other parts of the diets of these groups were also distinctive. This can be substantiated to some extent by historical records. Additional work on this aspect of the lifeways of Fort Laramie residents needs to be addressed. Third, while Fort Laramie was an "outpost," it was not completely isolated. The recovery of part of a French perfume

bottle and several examples and patterns of fine china (both English and Chinese) shows such luxury items were available at the fort, despite its remoteness. Likewise, the presence of children's toys shows a trade system was in effect that could afford to transport such luxury items.

Is this the Quartermaster's Dump?

We still do not understand the series of Euroamerican ditches that predate the 1880s dump episodes. Are these related to Quartermaster activities, perhaps providing drainage around the exterior of the Adobe Corral? Or are they related to earlier activities when this part of the river terrace was used as a fort garden area? If complete excavation of these feature were possible, an explanation might be easier to propose. While we also don't know the extent of the Euroamerican ditch features within the limits of Excavation Blocks One and Two, their extent within those blocks has been mapped or otherwise recorded for several meters back from the riverbank. Their remaining lengths are not in danger of being lost from additional riverbank erosion or mitigation activities. These are also significant in that they remain an undocumented historical event for which there is no written record. Additional archeological research is also warranted before they are disturbed by any activities. These resources also must be protected.

A significant amount of archeological data continues to exist within the project area. Primarily these are the remaining 20 dump episodes identified by the remote sensing and the projected 40 plus additional dump episodes that might be present. While all dump features excavated in 1994 can be dated to the 1880s, there is no data on what time periods are represented by these other dump features. Historical records show this area was used for the fort dump starting in

the 1860s. Little archeological data is available from Fort Laramie for this time period and these remaining dump features should be protected until such time as they can be investigated. They may contain highly significant data on the lifestyles of the late 19th century occupants of Fort Laramie.

Perhaps most significant to the overall goals of these investigations was determining that, at least in the block excavation areas examined here, no data were present showing this portion of the Laramie River bank can actually be identified as a "Quartermaster's Dump." All dump episodes show characteristics of being from living quarters or Sutler area cleanups and not activities consistent with the reported procedures for disposal of Quartermaster goods (see Chapter 1). If there is a "Quartermaster's Dump" at Fort Laramie, it was not along this specific part of the Laramie River bank. Historical records document that material was ordered to have been dumped "into" the river, and not placed on its bank. If so, then no evidence of the dump will ever be found, because all that material will have been washed downstream and all primary context destroyed. Other geophysical anomalies, however, could represent Quartermaster dump episodes. The archeological sampling of features used in this project may have inadvertently chosen only living area dump areas to be excavated. Only additional excavations can answer this question.

REFERENCES CITED

- Adams, Gerald M.
 1994 *The Post Near Cheyenne: A History of Fort D. A. Russell, 1867-1930*. Pruett Publishing Co., Boulder.
- Anderson, A. B.
 1973 *Test Excavations in Proposed Entrance Roadway, Fort Laramie National Historic Site*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- Anthony, Ross Orlando
 1930 *A History of Fort Laramie*. Unpublished M.A. Thesis, Department of History, University of Southern California.
- Auger, E.
 1867 Letter to Brevet Lieutenant Colonel E. E. Camp, A.Q.M., dated March 5, 1867. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Baxter, George and Michael D. Stone
 1980 *Amphibians and Reptiles of Wyoming. Wyoming Game and Fish Department, Bulletin 16*.
- Beaubien, P. L.
 1941 *Fort Laramie National Monument, Old Bakery Excavations*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- 1951a *Preliminary Report of the Archeological Investigations at Fort Laramie National Monument, 1950*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- 1951b *Excavation in the Area West of the Sutler's Store*. Submitted to National Park Service, Regional Historian, November 5, 1951. Copies available from National Park Service, Midwest Archeological Center, Lincoln, Nebraska.
- 1951c Report of Trip to Fort Laramie National Monument, September 18 to October 21. Memorandum to Regional Historian, November 5, 1951. On file, National Park Service, Midwest Archeological Center, Lincoln, Nebraska.
- 1953 *Sutler's Store Excavation, 1951, Fort Laramie National Monument*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- Bennet, J. A.
 1987 *The Divided Circle: A History*

- of Instruments for Astronomy, Navigation and Surveying.* Phaidon, Christie's Limited, Oxford.
- Binford, Lewis
1978 *Nunamiut Ethnoarchaeology.* Academic Press, New York.
- Birkeland, Peter W.
1984 *Soils and Geomorphology.* Oxford University Press, New York.
- Birkeland, Peter W., Michael N. Machette, and Kathleen M. Haller
1991 *Soils as a Tool for Applied Quaternary Geology. Utah Geological and Mineral Survey Miscellaneous Publication 91-3.* Utah Department of Natural Resources, Salt Lake City.
- Brechemin, L.
1886 Post Surgeon Monthly Report for July 1886. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
1888 Post Surgeon Monthly Report for April 1888. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Brechemin, L., Jr.
n.d. The Saw Mill Fire, May 1887, Approximately. Notes on file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Breiner, S.
1973 *Applications Manual for Portable Magnetometers.* Geometrics, Sunnyvale, CA.
- Brinkerhoff, Roeliff
1865 *The Volunteer Quartermaster: Containing a Collection and Codification of the Laws, Regulations, Rules, and Practice Governing the Quartermaster's Department of the United States Army, and In Force May 9, 1865.* Van Nostrand, New York.
- Briscoe, James
1992 *Artifact Analyses for an Area (34WD-74, Area A) of Historic Fort Supply, Woodward County, Oklahoma.* Oklahoma Archaeological Survey, Studies in Oklahoma's Past, Number 18.
- Buchanan, James A.
1872 Post Surgeon Monthly Report for January 1872. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Caldwell, D. G.
1884 Post Surgeon Monthly Report for July 1884. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
1885 Post Surgeon Monthly Report for January 1885. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Camp, E. E.
1867 Annual Estimate of Machinery Required at Fort Laramie D.T. for the Year Ending June 30th 1868. Letter to Department of the Platte Headquarters, dated January 31, 1867. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Caperton, Thomas J. And LoRheda Fry
1974 U. S. Army Food and Its Preparation During the Indian Wars with Selected Recipes. *El Palacio* 80(4):29-45.
- Carvillo, C.
1880a Post Surgeon Monthly Report for March 1880. On file, Fort Laramie National Historic Site,

- Fort Laramie, Wyoming.
- 1880b Post Surgeon Monthly Report for April 1880. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- 1881 Post Surgeon Monthly Report for February 1881. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Cellar, Craig
- 1976 *Test Excavations to Locate Ward and Guerrier Trading Post*. Submitted to National Park Service, Midwest Archeological Center. Copies available from National Park Service, Midwest Archeological Center, Lincoln, Nebraska.
- 1978 *Test Trenches Near Cavalry Barracks*. Submitted to National Park Service, Midwest Archeological Center. Copies available from National Park Service, Midwest Archeological Center, Lincoln, Nebraska.
- Chappell, Gordon S.
- 1962 The Fortifications of Old Fort Laramie. *Annals of Wyoming* 34(2): 145-162.
- Childs, S.D.
- 1866 Letter from S. D. Childs, Captain and A.Q.M. to Brevet Brig. General L. C. Easton, Off. Qr. Master Department of Missouri, dated March 10, 1866. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Clark, Anthony
- 1990 *Seeing Beneath the Soil: Prospecting Methods in Archaeology*. B. T. Batsford, Ltd., London.
- Crader, Diane C.
- 1984 The Zooarchaeology of the Storehouse and the Dry Well at Monticello. *American Antiquity* 49(3): 542-558.
- 1990 Slave Diet at Monticello. *American Antiquity* 55(4):690-717.
- Crass, David C. And D. L. Wallsmith
- 1992 Where's the Beef? Food Supply at an Antebellum Frontier Post. *Historical Archaeology* 26(2):3-23.
- De Vore, Steven LeRoy
- 1988 *Archeological Investigation of Quarry Tract 01-128 at Fort Laramie National Historic Site*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from National Park Service, Midwest Archeological Center, Lincoln, Nebraska.
- 1990 Ground-penetrating Radar as a Survey Tool in Archaeological Investigations: An Example from Fort Laramie National Historic Site. *The Wyoming Archaeologist* 33(1-2):23-38.
- 1992 Geophysical Investigation of Proposed Fort Williams Site. Unpublished cultural resource management project report prepared for National Park Service by Midwest Archaeological Center. On file, National Park Service, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Ebert, James I.
- 1992 *Distributional archaeology*. University of New Mexico Press, Albuquerque.

- Ehrenhard, John
- 1972 *The Rustic Hotel: Fort Laramie National Historic Site*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- 1973a *The Rustic Hotel, Fort Laramie National Historic Site, Wyoming. Historical Archaeology* 7:11-29.
- 1973b *Inspection for Subsurface Features Under the Floor Boards of Enlisted Men's Barracks and Determine Location of External Latrines Behind Same Structure*. Submitted to National Park Service, Midwest Archeological Center. Copies available from National Park Service, Midwest Archeological Center, Lincoln, Nebraska.
- Falk, Carl R.
- 1971 *Archeological Investigations at Fort Laramie National Historic Site, 1971: An Interim Report*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- Fawcett, William B.
- 1981 *Archeological Investigations at Fort Fred Steele (48CR380), Carbon County, Wyoming: An Archeological Research Plan and the Barracks Excavation of 1979*. Submitted to Wyoming Recreation Commission, Cheyenne, Wyoming. Copies available from Office of Wyoming State Archaeologist, Department of Anthropology, University of Wyoming, Laramie.
- Follett, F. M.
- 1859a Letter to Major General T. S. Jesup, Quarter Master General., January 21, 1859. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- 1859b Letter to Major General T. S. Jesup, Quarter Master General, July 1, 1859. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Francis, Julie E.
- 1984 *An Archaeological Research Design for South Pass City State Historic Site. Occasional Papers on Wyoming Archaeology* 3:131-150.
- Frazer, Robert W.
- 1983 *Forts and Supplies: The Role of the Army in the Economy of the Southwest, 1846-1861*. University of New Mexico Press, Albuquerque.
- Gann, Robert H.
- 1960 Archeological Section, Stabilization of the Sawmill -- Building Number 154, Fort Laramie National Monument, Fort Laramie, Wyoming. Unpublished cultural resource management project report prepared for National Park Service by Midwest Archaeological Center. On file, Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- Gile, L. H., F. F. Peterson, and R. B. Grossman
- 1966 Morphological and Genetic Se-

- quences of Carbonate Accumulation in Desert Soils. *Soil Science* 101:347-360.
- Girard, I. Basial
1869 Post Surgeon Monthly Report for June 1869. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Griffin, D.
1976 Field Notes, Fort Laramie. Field notes on file, Midwest Archaeological Center, Lincoln, Nebraska.
- Guilday, John E.
1970 Archaeological Investigation of Fort Ligonier. *Annals of Carnegie Museum* 42:177-186.
- Gurley, W.
1873 *American Engineers and Surveyors Instruments*. W&LE Gurley, Troy, New York.
- Gust, Sherri M.
1983 Problems and Prospects in Nineteenth Century California Zooarchaeology. In *Forgotten Places and Things: Archaeological Perspectives On American History*, Albert E. Ward, editor. Pp. 341-348. Center for Anthropological Studies, Albuquerque.
- Guthrie, R. L. and J. E. Witty
1982 New Designations for Soil Horizons and Layers and the New Soil Survey Manual. *Soil Science Society of America Journal* 46:443-444.
- Hafen, LeRoy R., and Francis Marion Young
1938 *Fort Laramie and the Pageant of the West, 1834-1890*. Glendale, California, Arthur H. Clark.
- Hardin, E. E.
1883 Record of Expenditures upon Public Buildings at Fort Laramie, Wy Ty. Microfilm on file, Wyoming Department of Commerce, Historical Research Section, Cheyenne, Wyoming.
- Hartsuff, A.A.
1874 Post Surgeon Monthly Report for September 1874. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Hedren, Paul L.
1988 *Fort Laramie in 1876: Chronicle Of a Frontier Post At War*. University of Nebraska Press, Lincoln.
- Heib, David
1954 *Fort Laramie National Monument, Wyoming*. National Park Service Historical Handbook Series, Number 20.
- Heimmer, D., G. C. Davenport, J. B. Gilmore, and J. L. Lindemann
1988 *Geophysical-ground Penetrating Radar Investigation: Fort Laramie National Historic Site, Fort Laramie, Wyoming*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Hendron, J. W.
1941a *An Introduction to the Archaeology of Fort Laramie*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Rocky Mountain Regional Office, National Park Service, Denver.
1941b *Beads from Old Fort Laramie*. Submitted to National Park Ser-

- vice, Midwest Archaeological Center. Copies available from Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Herskovitz, Robert M.
1978 *Fort Bowie Material Culture*. University of Arizona, Anthropological Papers, Number 31.
- Higgins, L.P.
1857 Annual Report of the Inspection of the Public Buildings at Fort Laramie N. T. June 30 1857. Letter to General Thos S. Jesup, dated July 10, 1857. On file, Fort Laramie National Historical Site, Fort Laramie, Wyoming.
- Howard, Arthur D.,
1959 Numerical Systems of Terrace Nomenclature, A Critique. *Journal of Geology* 67:239-243.
- Howell, T.L.
1993 Evaluating the utility of auger testing as a predictor of subsurface artifact density. *Journal of Field Archaeology* 20: 475-484.
- Husted, W. M.
1964 *Archeological Test Excavations at Fort Laramie National Historic Site, Wyoming, 1963*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Rocky Mountain Regional Office, National Park Service, Denver.
- Husted, W. M., and Jackson W. Moore, Jr.
1970 *Archeological Test Excavations at Fort Laramie National Historic Site, Wyoming, 1969: Circulatory Roads, Utilities, and Residences*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.
- Jesup, H. H.
1857 War Department: Report of the Quartermaster General, John B. Floyd. Senate Documents Volume 3, 35th Congress, 1st Session, Series 920, pp. 158, 161; November 21. Government Printing Office.
- Jessup, Wendy Claire
1992 *Collection Management Plan for Fort Laramie National Historic Site, Fort Laramie, Wyoming*. Submitted to National Park Service, Denver Regional Office. Copies available from Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Jolley, Robert L.
1983 North American Historic Sites Zooarchaeology. *Historical Archaeology* 17(2):64-79.
- Karlstrom, Eric T.
1988 Rates of Soil Formation on Black Mesa, Northeast Arizona: A Chronosequence in Late Quaternary Alluvium. *Physical Geography* 9:301-327.
- Krumbein, W. C. and L. L. Sloss
1963 *Stratigraphy and Sedimentation*. 2nd ed. W.S. Freeman, San Francisco.
- Landon, David B.
1996 Feeding Colonial Boston: A Zooarchaeological Study. *Historical Archaeology* 30(1):1-153.
- Lavender, David
1983 *Fort Laramie and the Changing Frontier*. United States Department-

- ment of the Interior, National Park Service Handbook, Number 118.
- Leopold, Luna B. and John P. Miller
 1954 A Post-Glacial Chronology for Some Alluvial Valleys in Wyoming. *United States Geological Survey Water Supply Paper* 1261.
- Lucecke, Barbara K.
 1990 *Feeding the Frontier Army 1775-1865*. Brenadier Publications, Eagan, Minnesota.
- Luhn, G. L.
 1870 Annual Report of Public Buildings at Fort Laramie WG. Ter. for the Year Ending June 30th 1870. Letter to F. F. Flint, dated Aug 9, 1870, on file, Fort Laramie National Historical Site, Fort Laramie, Wyoming.
- Lyman, R. L.
 1977 Analysis of Historical Faunal Remains. *Historical Archaeology* 11:67-73.
 1979 Available Meat From Faunal Remains. *American Antiquity* 44:536-546.
 1994 *Vertebrate Taphonomy*. Cambridge University Press, Cambridge.
- Machette, Michael N.
 1985 Calcic Soils of the Southwestern United States. *Geological Society of America Special Paper* 202:1-22.
- McFaul, Michael, Karen Lynn Traugh, Grant D. Smith, William Doering, and Christian J. Zier
 1994 Geoarchaeologic Analysis of South Platte River Terraces: Kersey, Colorado. *Geoarchaeology* 9:5:345-374.
- Massey, Rheba
 1990 *Wyoming's Comprehensive Historic Preservation Plan*. Submitted to National Park Service, Denver Regional Office. Copies available from Wyoming Department of Commerce, Division of Parks and Cultural Resources, Cheyenne, Wyoming.
- Mattes, Merrill J.
 1978 The Crusade to Save Fort Laramie. *Annals of Wyoming* 50(1): 5-57.
 1980 *Fort Laramie Park History, 1834-1977*. Rocky Mountain Regional Office, National Park Service, United States Department of the Interior, Denver.
- McNutt, C. H.
 1958 *Excavations at Old Bedlam, Fort Laramie*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.
- Miller, Darlis A.
 1989 *Soldiers and Settlers: Military Supply in the Southwest, 1861-1885*. University of New Mexico Press, Albuquerque.
- Miller, Mark E., and Dale L. Wedel, eds.
 1992 *Archaeological Survey and Test Excavations at Fort Fred Steele State Historic Site*. Submitted to Wyoming Department of Commerce, State Parks and Historic Sites. Copies available from Office of Wyoming State Archaeologist, Department of Anthropology, University of Wyoming, Laramie.

- Moonlight, T.
 1865 Endorsement of Letter by S. D. Childs, Captain & A.M.M. to J. A. Potter, Colonel & Chief Quarter Master, requesting permission to construct new structures for the storage of quartermaster goods, Dated June 11, 1865. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Morton, Alfred
 1876 Estimate Cost of Material and Labor Required During the Fiscal Year -- June 30, 1876, Abstracts for Lumber Needed. Microfilm on file, American Heritage Center, University of Wyoming, Laramie.
- National Park Service
 1942 *Fort Laramie, National Monument*. National Park Service, Department of the Interior, Washington, D.C.
 1982 *Development Concept Plan. Fort Laramie National Historic Site*. National Park Service, Department of the Interior, Washington, D.C.
 1984 *Museum Handbook. Part 2*. Government Printing Office, Washington, D.C.
 1986 *Fort Laramie Historic Building Guide*. National Park Service, Department of the Interior, Washington, D.C.
 1990 *Museum Handbook. Part 1*. Government Printing Office, Washington, D.C.
 1993 *Final Environmental Impact Statement, General Management Plan, Development Concept Plan, Interpretive Prospectus, Fort Laramie National Historic Site, Wyoming*. Copies available from Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Nadeau, Remi
 1967 *Fort Laramie and the Sioux*. University of Nebraska Press, Lincoln.
- Pickles, John., ed.
 1995 *Ground Truth: The Social Implications of Geographic Information Systems*. Guilford Press, New York.
- Price, Cynthia R.
 1985 Patterns of Cultural Behavior and Intra-site Distributions of Faunal Remains at the Widow Harris Site. *Historical Archaeology* 19(2):41-56.
- Quartermaster Corps
 n.d. Quarterly Return of Quartermaster's Stores Received, Issued, and Remaining on Hand. Form on file, American Heritage Center, University of Wyoming, Dan W. Greenburg Collection.
- Reheis, M. C., R. C. Palmquest, F. S. Agard, C. Jaworowski, B. Mears, Jr., R. F. Madole, A. R. Nelson, and G. D. Osborn
 1991 Quaternary History of Some Southern and Central Rocky Mountain Basins. In *Quaternary Non-Glacial Geology: Contemporaneous U.S., The Geology of North America*, vol. K-2, edited by Rodger B. Morrison, pp. 407-440. Geological Society of America, Boulder.
- Reineck, H. E. and I. B. Singh
 1980 *Depositional Sedimentary Environments*. 2nd ed. Springer-

- Verlag. Berlin.
- Ringebach, Ray B.
- 1958a Archeological Salvage Project, Water Distribution System. Unpublished cultural resource management project report prepared for National Park Service by Midwest Archeological Center. On file, Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- 1958b Supplement to Archeological Salvage Project, Water Distribution System. Unpublished cultural resource management project report prepared for National Park Service by Midwest Archeological Center. On file, Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- Rockman, Marcia Helen
- 1995 *Investigation of Faunal Remains and Social Perspectives on Natural Resource Use in an 1867 Wyoming Gold Mining Town*. Unpublished M. A. Thesis, Department of Anthropology, University of Arizona, Tucson.
- Romans, John R., William J. Costello, Kevin W. Jones, C. W. Carlson and P. T. Ziegler.
- 1977 *The Meat We Eat*. 12th ed. Interstate Printers and Publishers, Danville, Illinois.
- Rosenberg, Robert G.
- 1989 *Military Context and Property Types*. Submitted to Wyoming Archives Museums and Historical Department, State Historic Preservation Office. Copies available from Wyoming Department of Commerce, State Historic Preservation Office, Cheyenne, Wyoming.
- Rothschild, Nan A., and Darlene Balkwill
- 1993 The Meaning of Change in Urban Faunal Deposits. *Historical Archaeology* 27(2):71-89.
- Samson, Louise
- 1986 *Salvage Archeology of Sewer and Leach Line Project Cavalry Barracks, or Following the Backhoe*. Submitted to National Park Service, Midwest Archeological Center. Copies available from National Park Service, Midwest Archeological Center, Lincoln.
- Schuldenrein, J.
- 1991 Coring and the identity of cultural-resource environments: a comment on Stein. *American Antiquity* 56(1):131-137.
- Schulz, Peter D. and Sherri M. Gust
- 1983a Faunal Remains and Social Status in 19th Century Sacramento. *Historical Archaeology* 17(1):44-53.
- 1983b Relative Beef Cut Prices in the Late Nineteenth Century: A Note for Historic Sites Faunal Analysis. *Pacific Coast Archaeological Society Quarterly* 19(1):12-18.
- Scott, Douglas
- 1987 *Archeological Investigations at the Site of the Proposed Parking Lot: Fort Laramie National Historic Site*. Submitted to National Park Service, Midwest Archeological Center. Copies available from Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- 1989 *Archeological Monitoring of*

- Burt House Drainage Trenches at Fort Laramie National Historic Site.* Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.
- 1990 *Trench Monitoring Between the Cavalry Barracks and the Commissary, Fort Laramie National Historic Site.* Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.
- Scott, Douglas D., and Melissa A. Connor
1984 *Archeological Investigations at Fort Laramie National Historic Site, July 1984.* Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.
- Scott, Douglas D., W. E. Sudderth, and Christopher Schoen
1992 *Archeological Investigations of the 1874 Cavalry Barracks, Fort Laramie National Historic Site, Wyoming.* National Park Service, Midwest Archaeological Center, Technical Report, Number 16.
- Scott S., et al.
1991 Reorientation of Historic Maps of Old Fort Niagara Using Computer Assisted Cartography. *Journal of Field Archaeology* 18:319-343.
- Schell, H.S.
1868 Post Surgeon Monthly Report for September 1868. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
- Shanks, Michael and C. Tilley
1987 *Social Theory and Archaeology.* University of New Mexico Press, Albuquerque.
- Smith, Grant D., and Michael McFaul
1994 Geoarchaeologic and Paleoenviromental Interpretations of Two Alluvial Fill Terraces Associated with Archaeology site 39CU1144: Custer County, South Dakota. Paper presented at the third annual Island in the Plains Conference, Lead, South Dakota.
- Smith, G. Hubert
1939 *Archeological Report, Fort Laramie National Monument, Summer 1939.* Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archaeological Center, National Park Service, Lincoln, Nebraska.
- Soil Survey Staff
1962 *Soil Survey Manual.* Agricultural Handbook No. 18, United States Department of Agriculture, Washington, D.C.,
1975 *Soil Taxonomy.* Agricultural Handbook No. 436, United States Department of Agriculture, Washington, D.C.
- South, Stanley A.
1977a *Method and Theory in Historical Archaeology.* Academic Press, New York.
1977b *Research Strategies in Historical Archaeology.* Academic Press, New York.

- Spencer-Wood, Suzanne M.
 1987 *Consumer Choice in Historical Archaeology*. Plenum Press, New York.
- Stein, Julie K.
 1986 Coring archaeological sites. *American Antiquity* 51(3): 505-527.
 1991 Coring in CRM and archaeology: a reminder. *American Antiquity* 56(1): 138-142.
- South, Stanley A.
 1977 *Method and Theory in Historical Archaeology*. New York, Academic Press.
- Sudderth, W. E.
 1985 *Trench Monitoring, Fort Laramie National Historic Site, Fort Laramie, Wyoming*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- Sudderth, W. E., and Carol B. Raish
 1990 *A Summary of Archeological Investigations at the Site of the Proposed Visitor Center, Fort Laramie National Historic Site*. Submitted to National Park Service, Midwest Archaeological Center. Copies available from Midwest Archeological Center, National Park Service, Lincoln, Nebraska.
- U.S. Army
 1851 Quartermaster Map, Fort Laramie, Wyoming Territory. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
 1854 Quartermaster Map, Fort Laramie, Wyoming Territory. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
 1863 Quartermaster Map, Fort Laramie, Wyoming Territory. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
 1867 Quartermaster Map, Fort Laramie, Wyoming Territory. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
 1870 Quartermaster Map, Fort Laramie, Wyoming Territory. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
 1874 Quartermaster Map, Fort Laramie, Wyoming Territory. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
 1888 Quartermaster Map, Fort Laramie, Wyoming Territory. On file, Fort Laramie National Historic Site, Fort Laramie, Wyoming.
 1889 *Regulations for the Army of the United States 1889*. Government Printing Office, Washington, D.C.
- Walker, Danny N.
 1990 *An Archaeological Mitigation Plan for the County Road Relocation Project, South Pass City Historic District (48FR434), Wyoming*. Submitted to Wyoming Department of Commerce, State Parks and Historic Sites. Copies available from Office of Wyoming State Archaeologist,

- Department of Anthropology,
University of Wyoming, Laramie.
- 1994 An Archaeological Mitigation Plan for the Fort Laramie National Historic Site Quartermaster Dump Area. Submitted to National Park Service, Fort Laramie National Historic Site. Copies available from Office of Wyoming State Archaeologist, Department of Anthropology, University of Wyoming, Laramie.
- Walker, Danny N., and Jeff Hauff
1994 *A Data Recovery Plan for Historic Buildings Stabilization, South Pass City Historic District (48FR434), Fremont County, Wyoming*. Submitted to Wyoming Department of Commerce, State Parks and Historic Sites. Copies available from Office of Wyoming State Archaeologist, Department of Anthropology, University of Wyoming, Laramie.
- Waters, M. R.
1992 *Principles of Geoarchaeology: A North American Perspective*. University of Arizona Press, Tucson.
- Weymouth, John W.
1979 Magnetic Surveying of Archaeological Sites. In *Proceedings, First Conference on Scientific Research in the National Parks (National Park Service Transactions and Proceedings Series)* 5:941-948.
- Wheeler, David L. and William H. Landis
1996 "It is beef every day . . .": The Army Ration and the Enlisted Man, 1865-1890. *Military History of the West* 26(2): 129-157.
- Wilson, Rex L.
1961 Clay Tobacco Pipes from Fort Laramie. *Annals of Wyoming* 33(2):120-134.
1971 *Clay Tobacco Pipes from Fort Laramie National Historic Site and Related Locations*. Division of Archeology and Anthropology, Office of Archeology and Historic Preservation, National Park Service.
1981 *Bottles on the Western Frontier*. University of Arizona Press, Tucson.

APPENDIX ONE

GIS TRANSFORMED UTM COORDINATES, MILITARY STRUCTURES AT FORT LARAMIE NATIONAL HISTORIC SITE

by
William S. Woods

The following listing are transformed Universal Transverse Mercator (UTM's) locations for the various structures at Fort Laramie National Historic site, as calculated by Arc-Info during the GIS study on this structure (see Chapter 5). These coordinates are referenced by the structure numbers shown on the accompanying maps for each of the eight years for which data are available. Correlation between these structure numbers

and the Fort Laramie Historic Structure (HS) numbers are also presented. The UTM points shown here begin with the northern most corner of a structure, and proceed clockwise, with all notable arc direction changes (i.e., corners) represented. One should note the 1995 UTM's are actual UTM coordinates, and not transformed. All coordinates are in UTM Zone 13.

1995 STRUCTURES, FIGURE A.1

1. M.C. Staff, Standing walls, HS 146
2. Hospital, Standing walls, HS 13
3. Sawmill, Standing walls, HS 154
4. Barracks, Restored, HS 5
5. Post trader Dwelling, Depression
6. Post Trader Store, Restored, HS 2
7. Officers' Quarters, Restored, HS 4
8. Officers' Quarters, Restored, HS 6
9. Officers' Quarters, Foundation, HS 50
10. Magazine, Restored, HS 11,
11. Officers' Quarters, Foundation, HS 131
12. Old Bedlam, Restored, HS 1,
13. Officers' Quarters, Stand walls, HS 57
14. Officers' Quarters, Stand walls, HS 58
15. Officers' Quarters, Stand walls, HS 59
16. Officers' Quarters, Foundation, HS 60
17. Officers' Quarters, Foundation
18. Officers' Quarters, Restored, HS 7
19. Printing Office, Depression
20. Assorted Ice Houses, Depressions
21. Admin. Building, Standing walls, HS 75
22. Guardhouse, Restored, HS 8
23. Barracks, Foundation, HS 77
24. Barracks Kitchen, Foundation

25. New Guardhouse, Restored, HS 80
26. Barracks, Foundation, HS 45
27. Ass. Barracks, Mounds, Depressions
28. Commissary Storehouse Restored, HS 9
29. Granary (Bakery), Restored, HS 10
30. Bakery, Standing walls, HS 15

1995 UTM COORDINATES

- Structure 1
- 4672652,536734.4
4672646,536739.7
4672607,536676.9
4672614,536672.6
- Structure 2
- 4672545,536620.1
4672540,536621.5
4672536,536608.1
4672529,536609.6
4672529,536607.9
4672518,536610.9
4672519,536614.2
4672515,536615.8
4672511,536603.9
4672526,536599.6
4672526,536597.6

- 4672537,536594.2
- Structure 3
- 4672460,536702.1
4672454,536708.4
4672389,536655.9
4672394,536649.6
- Structure 4
- 4672325,536733.0
4672316,536738.4
4672292,536698.9
4672301,536693.6
- Structure 5
- 4672291,536754.3
4672285,536759.0
4672277,536748.1
4672283,536743.5
- Structure 6
- 4672274,536724.0
4672266,536727.2
4672259,536713.6
4672268,536709.7
- Structure 7
- 4672425,536459.2
4672417,536463.6
4672411,536453.6

4672420,536449.1
Structure 8
4672365,536620.8
4672357,536630.3
4672348,536622.1
4672356,536614.0
Structure 9
4672316,536575.4
4672304,536590.0
4672286,536575.4
4672298,536560.8
Structure 10
4672299,536548.3
4672294,536558.3
4672286,536568.1
4672279,536562.8
4672295,536544.7
Structure 11
4672282,536537.8
4672271,536555.5
4672259,536545.8
4672266,536536.4
4672268,536537.3
4672273,536530.8
Structure 12
4672266,536519.8
4672262,536524.9
4672256,536519.1
4672260,536514.6
Structure 13
4672256,536527.0
4672252,536530.8
4672255,536533.6
4672249,536540.8
4672241,536535.1
4672252,536523.7
Structure 14
4672243,536528.1
4672238,536533.3
4672222,536518.8
4672226,536513.7
4672227,536514.9
4672234,536508.1
4672238,536511.8
4672232,536518.8
Structure 15
4672224,536504.2
4672222,536507.6
4672215,536502.6
4672209,536511.3
4672196,536501.4
4672202,536492.6
4672196,536487.7
4672198,536484.1
Structure 16
4672200,536459.3
4672191,536471.3
4672193,536472.9
4672185,536482.0
4672173,536472.4
4672181,536463.5
4672183,536464.9
4672193,536453.2
Structure 17

4672170,536454.7
4672161,536465.2
4672149,536455.2
4672158,536445.1
Structure 18
4672147,536436.2
4672140,536445.1
4672128,536435.6
4672135,536427.4
Structure 19
4672097,536433.8
4672090,536442.6
4672087,536438.9
4672091,536433.9
4672084,536428.2
4672086,536425.8
Structure 20
4672091,536461.6
4672079,536476.8
4672076,536474.3
4672088,536459.2
Structure 21
4672071,536491.3
4672059,536506.6
4672048,536497.6
4672049,536495.5
4672043,536489.9
4672051,536478.9
4672058,536484.1
4672060,536482.3
Structure 22
4672069,536393.4
Structure 23
4672062,536402.4
Structure 24
4672037,536407.3
Structure 25
4672034,536413.8
Structure 26
4672027,536425.2
Structure 27
4672025,536431.7
Structure 28
4672021,536437.1
Structure 29
4672017,536444.5
Structure 30
4672031,536495.3
4672025,536502.8
4672014,536493.4
4672020,536486.5
Structure 31
4672080,536570.6
4672063,536590.0
4672055,536583.3
4672065,536571.3
4672049,536557.4
4672056,536549.9
Structure 32
4672075,536605.9
4672071,536610.4
4672063,536603.7
4672067,536599.3
Structure 33

4672148,536628.2
4672142,536634.4
4672093,536593.8
4672098,536587.1
Structure 34
4672135,536637.5
4672130,536642.6
4672086,536607.1
4672091,536600.8
Structure 35
4672172,536637.6
4672172,536649.4
4672157,536648.1
4672158,536636.4
Structure 36
4672239,536570.6
4672184,536638.1
4672176,536631.8
4672232,536564.1
Structure 37
4672240,536589.8
4672237,536593.1
4672232,536589.3
4672235,536586.1
Structure 38
4672218,536616.5
4672215,536620.2
4672210,536615.8
4672213,536612.3

1888 STRUCTURES, FIGURE A.1

1. N.C. Staff, HS 146
2. Hospital, HS 13
3. Stables, HS 140
4. Stage Company Stables, HS 150
5. Rustic Hotel, HS 152
6. Saw Mill, HS 153
7. Low Wet Ground
8. Officers' Quarters
9. Barracks, HS 5
10. Sutler's House, HS 135
11. Sutler's Store, HS 2
12. Officers' Quarters
13. Officers' Quarters
14. Officers' Quarters, HS 11
15. Officers' Quarters, HS 57
16. Old Bedlam, HS 1
17. Officers' Quarters, HS 57
18. Officers' Quarters, HS 58
19. Officers' Quarters, HS 59
20. Officers' Quarters, HS 65
21. Officers' Quarters, HS 60
22. Officers' Quarters, HS 73
23. Printing Office, HS 69
24. Officers' Quarters
25. Administration Building, HS 75
26. Library, HS 76
27. Magazine, HS 8
28. Barracks, HS 77
29. Kitchen, HS 78
30. New Guardhouse, HS 81
31. Sink, HS 82
32. Storehouse, HS 9
33. Granary, HS 10



Figure A.1: UTM reference maps. Left = 1995. Right = 1888.

34. Bakery, HS 15
35. Q.M. Storehouse, HS 102
36. Q.M. Storehouse, HS 103
37. Telegraph Office, HS 94
38. Married Mens' Quarters, HS 91
39. Q.M. Shops, HS 106
40. Q.M. Shops, HS 110
41. Q.M. Shops, HS 109
42. Q.M. Shops
43. Q.M. Shops, HS 105
44. Q.M. Shops, HS 104
45. Q.M. Storehouse, HS 118
46. Q.M. Storehouse, HS 113
47. Barracks, HS 130
48. Kitchens, HS 127-128

1888 TRANSFORMED UTM COORDINATES

Structure 1

4672670,536799.9
4672602,536847.1
4672596,536839.8
4672664,536793.6

Structure 2

4672651,536731.8
4672645,536735.0
4672604,536679.9
4672610,536676.7

Structure 3

4672620,536742.3
4672551,536788.9
4672491,536716.2
4672554,536674.4
4672608,536739.0
4672614,536735.1

Structure 4

4672548,536603.2
4672537,536606.4
4672535,536605.4
4672535,536606.5
4672532,536607.3
4672531,536605.4
4672528,536606.7
4672528,536608.3
4672523,536609.5
4672522,536607.2
4672520,536607.5
4672517,536598.5
4672532,536594.7
4672532,536593.0
4672543,536589.9

Structure 5

4672463,536700.0
4672459,536704.9
4672388,536656.7
4672393,536651.9

Structure 6

4672402,536588.6
4672398,536594.6
4672365,536571.8
4672370,536565.9

Structure 7

4672358,536628.8
4672355,536631.8

4672352,536630.5
4672351,536631.3
4672348,536629.4
4672346,536630.2
4672344,536627.1
4672344,536626.5
4672340,536622.9
4672343,536618.9
4672346,536620.4
4672349,536617.1
4672356,536622.1
4672356,536623.3
4672357,536624.6
4672355,536627.4

Structure 8

4672316,536572.9
4672307,536583.7
4672290,536572.3
4672299,536561.9

Structure 9

4672295,536552.3
4672293,536555.1
4672294,536556.0
4672288,536563.1
4672282,536559.1
4672288,536552.4
4672290,536552.9
4672291,536550.0

Structure 10

4672285,536534.7
4672279,536542.2
4672280,536543.3
4672270,536555.2
4672257,536547.0
4672268,536534.5
4672270,536535.6
4672276,536528.3
4672277,536528.9
4672279,536527.2
4672284,536531.4

Structure 11

4672267,536519.9
4672249,536540.6
4672242,536535.4
4672260,536514.4

Structure 12

4672248,536518.6
4672240,536528.6
4672242,536530.3
4672239,536533.8
4672222,536521.4
4672225,536517.8
4672227,536518.4
4672232,536512.6
4672237,536515.8
4672231,536521.8
4672235,536524.1
4672238,536522.0
4672240,536523.3
4672245,536516.9

Structure 13

4672220,536490.4
4672213,536499.3
4672215,536500.6

4672206,536511.3
4672195,536504.1
4672204,536493.1
4672206,536494.3
4672214,536485.5
Structure 14
4672201,536459.9
4672189,536473.4
4672191,536475.3
4672183,536484.2
4672171,536473.4
4672179,536464.3
4672182,536466.8
4672194,536453.6

Structure 15

4672178,536439.9
4672167,536453.8
4672169,536456.6
4672161,536464.7
4672152,536454.1
4672171,536432.2

Structure 16

4672155,536418.1
4672149,536424.5
4672153,536428.1
4672139,536443.9
4672130,536436.1
4672150,536413.6

Structure 17

4672117,536431.9
4672106,536445.9
4672093,536435.6
4672089,536440.0
4672084,536435.9
4672090,536429.6
4672087,536427.6
4672090,536425.0
4672097,536431.6
4672105,536421.9

Structure 18

4672093,536462.6
4672081,536477.9
4672077,536475.6
4672075,536478.6
4672070,536474.9
4672071,536473.4
4672064,536466.6
4672066,536464.6
4672063,536462.1
4672065,536460.1
4672068,536462.0
4672069,536460.8
4672075,536465.9
4672079,536460.8
4672069,536451.8
4672072,536448.2
4672075,536450.4
4672077,536449.5
4672083,536454.9
4672085,536454.1

Structure 19

4672070,536493.8
4672060,536506.3
4672049,536497.6

| | | |
|------------------|------------------|--|
| 4672050,536496.1 | 4672324,536733.4 | Structure 43 |
| 4672043,536490.4 | 4672318,536737.6 | 4672222,536765.3 |
| 4672046,536486.8 | 4672293,536698.3 | 4672218,536766.2 |
| 4672051,536491.2 | 4672300,536694.3 | 4672215,536760.3 |
| 4672055,536486.1 | Structure 31 | 4672216,536758.8 |
| 4672050,536481.1 | 4672273,536725.8 | 4672219,536757.8 |
| 4672052,536478.7 | 4672268,536727.7 | Structure 44 |
| Structure 20 | 4672262,536712.6 | 4672091,536765.3 |
| 4672027,536493.4 | 4672268,536710.6 | 4672082,536772.6 |
| 4672021,536499.1 | Structure 32 | 4672046,536726.6 |
| 4672013,536491.6 | 4672291,536754.8 | 4672036,536719.2 |
| 4672018,536486.1 | 4672285,536758.0 | |
| Structure 21 | 4672277,536744.2 | |
| 4672031,536521.0 | 4672283,536741.3 | 1874 STRUCTURES, FIGURE A.2 |
| 4672018,536534.1 | Structure 33 | 1. Stables, HS 140 |
| 4672015,536531.5 | 4672259,536754.6 | 2. Old Hospital, HS 139 |
| 4672020,536525.6 | 4672252,536756.8 | 3. Sutler's House, HS 135 |
| 4672016,536522.3 | 4672236,536717.9 | 4. Sutler's Store, HS 2 |
| 4672022,536516.6 | 4672244,536716.2 | 5. Officers' Quarters, HS 11 |
| 4672026,536520.6 | Structure 34 | 6. Officers' Quarters, HS 57 |
| 4672028,536518.4 | 4672242,536758.2 | 7. Old Bedlam, HS 1 |
| Structure 22 | 4672236,536760.5 | 8. Officers' Quarters, HS 57 |
| 4672081,536571.0 | 4672220,536721.2 | 9. Officers' Quarters, HS 58 |
| 4672063,536589.8 | 4672227,536719.6 | 10. Officers' Quarters, HS 59 |
| 4672055,536582.1 | Structure 35 | 11. Officers' Quarters |
| 4672065,536570.9 | 4672438,536816.7 | 12. Officers' Quarters, HS 65 |
| 4672049,536556.3 | 4672432,536821.3 | 13. Officers' Quarters, HS 60 |
| 4672054,536549.8 | 4672422,536805.6 | 14. Officers' Quarters, HS 73 |
| Structure 23 | 4672428,536801.3 | 15. Ice Houses |
| 4672057,536572.6 | Structure 36 | 16. Adjutant's Office, HS 70 |
| 4672053,536577.4 | 4672427,536824.9 | 17. Ice House |
| 4672034,536561.6 | 4672422,536827.9 | 18. Band Quarters, HS 74 |
| 4672038,536557.2 | 4672411,536810.8 | 19. Mess Kitchen, HS 76 |
| Structure 24 | 4672416,536807.9 | 20. Guardhouse, HS 8 |
| 4672075,536601.6 | Structure 37 | 21. Barracks, HS 77 |
| 4672072,536606.0 | 4672409,536833.0 | 22. Storerooms, Kitchens, HS 78 |
| 4672064,536599.4 | 4672403,536836.6 | 23. Barracks, HS 130 |
| 4672068,536595.1 | 4672396,536823.1 | 24. Kitchens, HS 127-128 |
| Structure 25 | 4672400,536819.6 | 25. A.Q.M. Stores, HS 113 |
| 4672151,536623.5 | Structure 38 | 26. Post Office, HS 114 |
| 4672144,536632.9 | 4672426,536871.8 | 27. Bakery, HS 115 |
| 4672093,536594.8 | 4672422,536874.9 | 28. A.C.S. Office, HS 116 |
| 4672100,536585.2 | 4672415,536865.3 | 29. A.Q.M. Office, HS 117 |
| Structure 26 | 4672420,536862.2 | 30. A.C.S. Stores, HS 118 |
| 4672137,536635.8 | Structure 39 | 31. Laundress' Quarters, HS 82 |
| 4672133,536642.2 | 4672396,536848.2 | 32. A.Q.M. Employee Quarters, HS 95 |
| 4672087,536607.3 | 4672388,536852.9 | 33. Cavalry Quarters |
| 4672091,536602.1 | 4672378,536836.8 | 34. Laundress' Quarters |
| Structure 27 | 4672385,536831.6 | 35. Paint Shop, Coal Shed, HS 106, 108 |
| 4672239,536570.3 | Structure 40 | 36. Carpenter, HS 110 |
| 4672199,536619.6 | 4672374,536858.8 | 37. Wheelwright, HS 109 |
| 4672191,536611.6 | 4672368,536862.2 | 38. Blacksmith, HS 105 |
| 4672230,536563.0 | 4672360,536849.4 | 39. Saddler, HS 104 |
| Structure 28 | 4672365,536845.8 | 40. A.Q.M. Storehouse, HS 118 |
| 4672170,536641.1 | Structure 41 | 41. A.Q.M. Storehouse, HS 113 |
| 4672169,536650.1 | 4672361,536887.7 | 42. Hay Yard |
| 4672156,536649.3 | 4672352,536894.1 | 43. A.Q.M. Corral and Stables, HS 98 |
| 4672157,536639.9 | 4672335,536867.6 | 44. Post Garden |
| Structure 29 | 4672344,536860.8 | |
| 4672151,536660.3 | Structure 42 | TRANSFORMED 1974 UTM |
| 4672143,536669.0 | 4672334,536906.5 | COORDINATES |
| 4672139,536665.1 | 4672326,536912.7 | Structure 1 |
| 4672146,536656.4 | 4672309,536885.6 | 4672559,536745.4 |
| Structure 30 | 4672317,536879.2 | 4672506,536777.4 |
| | | 4672501,536768.1 |



Figure A.2: UTM reference maps. Left = 1874. Right = 1870.

4672554,536735.9
Structure 2
4672538,536699.3
4672481,536734.9
4672477,536726.6
4672534,536691.7
Structure 3
4672425,536589.3
4672418,536599.0
4672381,536570.1
4672390,536560.3
4672406,536572.7
4672415,536560.3
4672422,536565.8
4672413,536578.0
Structure 4
4672363,536626.5
4672359,536631.0
4672345,536618.8
4672349,536614.1
4672352,536617.2
4672355,536613.7
4672362,536619.4
4672359,536623.0
Structure 5
4672322,536568.7
4672318,536573.9
4672305,536564.6
4672298,536573.8
4672311,536584.1
4672306,536590.4
4672286,536575.2
4672303,536553.8
Structure 6
4672289,536560.4
4672280,536570.8
4672275,536566.1
4672283,536555.9
Structure 7
4672256,536534.4
4672249,536543.1
4672243,536537.8
4672250,536528.9
Structure 8
4672266,536519.8
4672261,536525.6
4672256,536521.2
4672261,536515.1
Structure 9
4672242,536530.4
4672239,536535.1
4672221,536521.1
4672226,536516.5
4672227,536517.4
4672229,536514.4
4672232,536516.8
4672230,536519.9
Structure 10
4672226,536505.6
4672221,536511.2
4672214,536506.6
4672210,536511.8
4672196,536500.9
4672200,536495.3

4672194,536488.8
4672199,536484.2
Structure 11
4672188,536485.1
4672187,536495.5
4672130,536447.7
4672134,536442.4
Structure 12
4672199,536462.1
4672191,536471.3
4672183,536464.9
4672188,536460.3
4672190,536462.3
4672193,536458.8
4672195,536460.7
4672196,536459.9
Structure 13
4672177,536441.3
4672169,536452.4
4672162,536446.4
4672166,536441.9
4672169,536445.5
4672175,536439.1
Structure 14
4672152,536431.2
4672148,536435.4
4672141,536429.4
4672148,536420.6
4672151,536422.6
4672147,536427.4
Structure 15
4672141,536416.4
4672134,536424.4
4672131,536421.4
4672138,536413.9
Structure 16
4672116,536433.3
4672105,536447.6
4672095,536438.7
4672090,536443.3
4672085,536439.6
4672090,536434.2
4672089,536432.7
4672093,536428.6
4672098,536433.6
4672106,536425.1
Structure 17
4672092,536461.6
4672079,536476.5
4672072,536470.3
4672085,536455.3
Structure 18
4672070,536489.4
4672060,536500.1
4672046,536488.1
4672048,536485.6
4672053,536489.7
4672058,536485.4
4672052,536481.2
4672055,536477.7
Structure 19
4672032,536495.3
4672025,536502.6
4672014,536493.2

4672021,536485.8
Structure 20
4672012,536523.1
4672009,536525.9
4672004,536521.5
4672007,536518.3
Structure 21
4672083,536564.7
4672079,536569.1
4672056,536548.8
4672060,536544.5
Structure 22
4672061,536575.9
4672058,536579.6
4672042,536564.7
4672045,536561.1
Structure 23
4672072,536584.2
4672064,536593.1
4672061,536589.7
4672068,536581.2
Structure 24
4672072,536601.5
4672068,536607.9
4672062,536602.8
4672066,536596.7
Structure 25
4672147,536627.9
4672141,536633.9
4672093,53593.2
4672099,536587.4
Structure 26
4672136,536638.0
4672132,536642.0
4672086,536605.0
4672091,536600.6
Structure 27
4672240,536570.4
4672184,536637.9
4672177,536631.9
4672232,536564.4
Structure 28
4672252,536578.8
4672235,536598.8
4672229,536593.6
4672246,536573.9
Structure 29
4672227,536607.3
4672213,536625.7
4672207,536621.0
4672221,536602.7
Structure 30
4672204,536633.8
4672195,536644.9
4672190,536641.4
4672199,536630.4
Structure 31
4672317,536747.8
4672307,536749.6
4672295,536717.0
4672306,536714.6
Structure 32
4672281,536701.1
4672278,536702.1

4672274,536690.3
 4672276,536689.5
 Structure 33
 4672284,536723.4
 4672283,536723.5
 4672285,536730.7
 4672283,536731.5
 4672279,536724.3
 4672277,536724.8
 4672276,536720.3
 4672283,536718.1
 Structure 34
 4672276,536756.6
 4672265,536758.7
 4672253,536725.3
 4672264,536722.8
 Structure 35
 4672259,536760.4
 4672249,536762.2
 4672238,536728.3
 4672247,536726.7
 Structure 36
 4672297,536817.2
 4672286,536819.3
 4672273,536783.8
 4672284,536781.4
 Structure 37
 4672215,536726.3
 4672211,536727.6
 4672205,536712.3
 4672209,536711.3
 Structure 38
 4672225,536750.4
 4672221,536751.7
 4672215,536736.9
 4672219,536735.5
 Structure 39
 4672234,536772.2
 4672231,536773.4
 4672228,536764.8
 4672230,536763.9
 Structure 40
 4672440,536821.0
 4672436,536823.3
 4672425,536803.9
 4672428,536801.9
 Structure 41
 4672426,536830.2
 4672421,536833.3
 4672411,536814.7
 4672414,536811.8
 Structure 42
 4672409,536835.6
 4672405,536838.8
 4672395,536823.6
 4672401,536820.5
 Structure 43
 4672394,536849.9
 4672387,536854.9
 4672377,536837.0
 4672384,536832.4
 Structure 44
 4672374,536859.7
 4672369,536862.1

4672362,536848.5
 4672365,536845.9
 Structure 45
 4672360,536888.6
 4672349,536895.8
 4672333,536868.8
 4672344,536861.9
 Structure 46
 4672334,536906.3
 4672324,536913.5
 4672307,536885.4
 4672317,536878.9
 Structure 47
 4672485,536998.3
 4672403,537091.8
 4672330,536927.1
 4672371,536896.9
 Structure 48
 4672385,537165.9
 4672332,537184.6
 4672280,537029.3
 4672272,537000.7
 4672282,536998.0
 4672261,536937.4
 4672300,536934.8
 4672329,537016.3
 Structure 49
 4672255,536856.9
 4672249,536857.6
 4672234,536805.3
 4672240,536804.1
 4672240,536807.7
 4672245,536807.1
 4672247,536811.9
 4672242,536812.4
 4672245,536820.8
 4672251,536820.3
 4672252,536825.8
 4672246,536826.6
 4672248,536832.4
 4672254,536831.4
 4672255,536836.1
 4672249,536837.5
 Structure 50
 4672095,536737.3
 4672087,536741.9
 4672036,536671.5
 4672044,536667.1

1870 STRUCTURES, FIGURE A.2

1. Trench works
2. Grave Yard
3. Stables, HS 140
4. Hospital, HS 139
5. Sutler's House, HS 135
6. Sutler's Store, HS 2
7. Arsenal, HS 11
8. Officers' Quarters, HS 57
9. Old Bedlam, HS 1
10. Officers' Quarters, HS 57
11. Officers' Quarters, HS 58
12. Officers' Quarters, HS 59
13. Stables, HS 141
14. Officers' Quarters, HS 65

15. Officers' Quarters, HS 60
16. Officers' Quarters, HS 7
17. Adjutant's Office, HS 70
18. Band Quarters, HS 72
19. Icehouse
20. Barracks, HS 74
21. Kitchens, HS 76
22. Guardhouse, HS 8
23. Barracks, HS 77
24. Kitchens, HS 78
25. Barracks, HS 130
26. Kitchens, HS 127-128
27. Laundress Quarters
28. Bakery, HS 49
29. Barracks
30. Post Office, HS 114
31. A.C.S. Storehouse
32. A.Q.M. Storehouse
33. A.C.S. Storehouse
34. Corn mill
35. Officers' Quarters, HS 95
36. Laundress' Quarters, HS 82
37. Telegraph Office
38. Carpenter, HS 110
39. Wheelwright, HS 109
40. Paint Shop, HS 108
41. Blacksmith, HS 105
42. Coal House, HS 106
43. Saddler, HS 104
44. Quartermaster's Storehouse, HS 113
45. Grain house, HS 102
46. Hay Yard
47. Corral, Stable, HS 98
48. Browns Hotel, HS 92

1870 TRANSFORMED UTM COORDINATES

Structure 1
 4672485,536582.3
 4672596,536573.9
 4672600,536565.9
 4672611,536564.2
 4672617,536572.2
 4672615,536581.4
 4672610,536584.9
 4672615,536697.4
 4672611,536721.4
 4672604,536735.3
 4672609,536739.4
 4672611,536752.1
 4672600,536756.3
 4672594,536752.9
 4672581,536768.1
 Structure 2
 4672602,536657.7
 4672520,536654.8
 4672485,536592.0
 4672597,536583.2
 Structure 3
 4672567,536768.6
 4672521,536806.4
 4672468,536734.0
 4672514,536695.2
 Structure 4

4672458,536586.1
4672445,536603.8
4672431,536591.7
4672420,536604.6
4672382,536570.1
4672404,536539.5
Structure 5
4672398,536632.8
4672387,536647.0
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Structure 6
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Structure 7
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Structure 8
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4672258,536520.5
Structure 9
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Structure 10
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4672226,536515.5
Structure 11
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Structure 12
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Structure 13
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Structure 17
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Structure 18
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Structure 19
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Structure 20
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Structure 21
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Structure 22
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Structure 23
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Structure 24
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Structure 25
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Structure 26
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Structure 27
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Structure 28
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4672226,536600.4
4672239,536585.9
Structure 29
4672225,536612.8
4672212,536629.8
4672206,536625.1
4672220,536608.9
Structure 30
4672253,536597.4
4672245,536608.1
4672240,536603.7
4672249,536593.8
Structure 31
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4672262,536607.8
4672258,536604.8
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4672266,536603.2
Structure 32
4672253,536626.2
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4672249,536622.9
Structure 33
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Structure 34
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4672225,536623.4
Structure 35
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4672306,536714.4
Structure 36
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4672277,536700.1
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4672278,536686.6
Structure 37
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4672260,536738.2
4672267,536733.8
Structure 38
4672269,536774.7
4672262,536778.3
4672246,536745.5
4672254,536741.0
Structure 39
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4672207,536702.6
4672204,536704.5
4672199,536692.1
4672205,536688.5
Structure 40
4672219,536725.4
4672210,536730.3
4672203,536714.1
4672213,536709.0
Structure 41
4672231,536745.2
4672219,536751.4
4672212,536734.9
4672225,536729.1
Structure 42
4672239,536766.9
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4672234,536752.6
Structure 43
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4672280,536829.8
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Structure 44
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Structure 45
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Structure 46
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Structure 47
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4672391,536827.5
Structure 48
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Structure 49
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Structure 50
4672364,536886.1
4672351,536895.2
4672336,536865.5
4672348,536857.6
Structure 51
4672336,536905.4
4672324,536913.4
4672309,536883.9
4672321,536876.1
Structure 52
4672464,537026.6
4672358,537066.6
4672328,536929.2
4672379,536896.1
Structure 53
4672333,537084.1
4672278,537100.1
4672249,536970.9
4672248,536920.6
4672251,536917.6
4672261,536918.6
4672263,536921.3
4672299,536911.8
4672312,536974.3
4672319,536975.0
4672324,536985.9
4672315,536998.1
Structure 54
4672325,536856.8
4672308,536866.8
4672294,536832.7
4672312,536823.4
Structure 55
4672263,536837.3
4672256,536839.3
4672258,536846.6
4672251,536848.4
4672243,536816.8
4672257,536811.9
Structure 56
4672127,536810.3
4672121,536814.1
4672116,536805.0
4672109,536809.5
4672106,536802.1
4672120,536794.5

1867 STRUCTURES, FIGURE A.3

1. Trench works
2. Grave Yard
3. Stables, HS 140
4. Hospital, HS 139
5. Sutler's House, HS 135
6. Sutler's Store, HS 2
7. Arsenal, HS 11

8. Officers' Quarters, HS 57
9. Old Bedlam, HS 1
10. Officers' Quarters, HS 57
11. Officers' Quarters, HS 58
12. Officers' Quarters, HS 59
13. Stables, HS 141
14. Native American Lodges
15. Officers' Quarters, HS 60
16. Icehouse
17. Adjutant's Office, HS 70
18. Ice House
19. Band Room, HS 72
20. Barracks, HS 74
21. Kitchens, HS 76
22. Guardhouse, HS 8
23. Barracks, HS 77
24. Barracks, HS 78
25. Barracks
26. Barracks
27. Bakery, HS 49
28. Quartermaster's Storehouse
29. Post Office, HS 114
30. Carpenter, HS 110
31. Commissary Office
32. Quartermaster's Storehouse
33. Laundress' Quarters, HS 82
34. Saddler, HS 104
35. Commissary Storehouse, HS 113
36. Lumber
37. Corn Pile
38. Quartermaster's Quarters, HS 95
39. Mill Yard
40. Storehouse
41. Blacksmith, HS 105
42. Hay Yard
43. Wood Yard
44. Corral
45. Corral, HS 98
46. Browns Hotel, HS 92

1867 TRANSFORMED UTM COORDINATES

Structure 1
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4672484,536581.4
4672591,536574.2
4672591,536566.9
4672600,536566.3
4672606,536572.8
4672606,536580.1
4672599,536584.4
4672612,536702.2
4672606,536724.0
4672602,536734.9
4672608,536739.3
4672610,536750.2
4672600,536753.1
4672596,536748.0
4672541,536814.9
4672525,536812.0
Structure 2
4672599,536655.6
4672517,536655.6

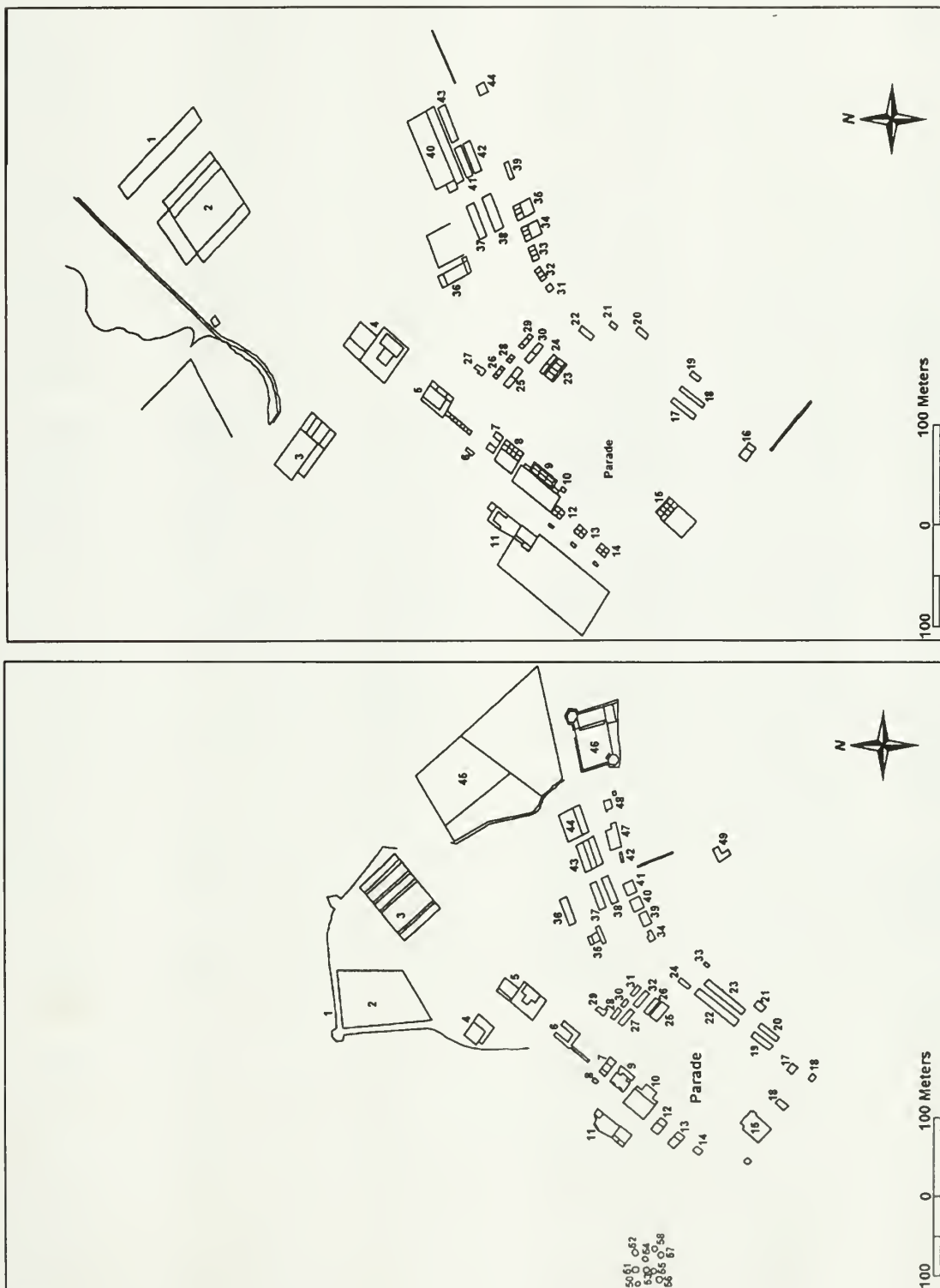


Figure A.3: UTM reference maps. Left = 1867. Right = 1863.

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Structure 3
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4672514,536694.9
Structure 4
4672439,536574.4
4672421,536600.5
4672402,536583.4
4672417,536562.3
4672421,536565.5
4672425,536561.1
Structure 5
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4672371,536633.1
4672364,536642.5
4672360,536639.6
4672367,536629.9
4672362,536625.2
4672367,536618.1
4672359,536612.8
4672354,536618.4
4672350,536615.5
4672342,536624.6
4672335,536618.4
4672352,536592.6
Structure 6
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4672309,536565.6
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4672306,536557.5
4672308,536557.5
Structure 7
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Structure 8
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Structure 9
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4672244,536530.3
4672241,536534.1
4672224,536520.3
4672227,536515.9
4672229,536515.9
4672231,536513.3
4672235,536516.4
4672232,536519.1
4672239,536524.9

4672241,536522.3
Structure 10
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4672198,536484.6
Structure 11
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Structure 12
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4672195,536447.5
Structure 13
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Structure 14
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Structure 15
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4672053,536453.6
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Structure 16
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4672037,536477.2
Structure 17
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Structure 18
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4672002,536513.9

Structure 19
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4672056,536554.5
Structure 20
4672070,536584.2
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4672043,536571.2
4672047,536566.0
Structure 21
4672076,536611.8
4672071,536618.3
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4672066,536603.6
Structure 22
4672150,536627.0
4672145,536633.9
4672094,536593.1
4672101,536586.2
Structure 23
4672137,536639.2
4672133,536646.1
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4672090,536600.5
Structure 24
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4672167,536648.3
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4672158,536633.3
Structure 25
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4672196,536591.9
Structure 26
4672213,536604.0
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4672193,536617.9
4672208,536600.3
Structure 27
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4672231,536607.5
4672224,536603.3
4672239,536585.9
Structure 28
4672254,536596.3
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4672241,536605.3
4672250,536593.4
Structure 29
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4672261,536607.3
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4672263,536598.1
4672267,536600.6
4672268,536602.8
Structure 30
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4672236,536620.4
4672231,536617.2
4672238,536609.3

Structure 31
 4672230,536626.4
 4672220,536638.5
 4672217,536635.3
 4672224,536623.6
 Structure 32
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 4672206,536627.3
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 Structure 33
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 Structure 34
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 Structure 36
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 Structure 37
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 4672273,536771.1
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 4672269,536734.1
 Structure 38
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 4672245,536745.3
 4672253,536742.2
 Structure 39
 4672219,536728.3
 4672210,536733.5
 4672203,536718.5
 4672213,536712.9
 Structure 40
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 4672219,536751.9
 4672212,536738.0
 4672225,536731.6
 Structure 41
 4672239,536767.1
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 4672221,536757.9
 4672233,536752.1
 Structure 42
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 4672240,536808.1

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 4672241,536794.4
 Structure 43
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 Structure 44
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 4672308,536820.8
 Structure 45
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 4672342,536878.1
 4672351,536861.2
 4672409,536846.1
 4672454,536822.0
 Structure 46
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 4672309,536970.1
 Structure 47
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 4672254,536838.3
 4672254,536842.9
 4672249,536846.1
 4672241,536814.9
 4672254,536810.3
 Structure 48
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 4672252,536863.8
 4672259,536859.9
 Structure 49
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 Structure 50
 4672221,536257.4
 Structure 51
 4672223,536274.5
 Structure 52
 4672223,536296.4
 Structure 53
 4672210,536275.0
 Structure 54
 4672211,536288.7
 Structure 55

4672201,536272.5
 Structure 56
 4672193,536262.8
 Structure 57
 4672192,536294.3
 Structure 58
 4672199,536301.3

1863 STRUCTURES, FIGURE A.3

1. Grave Yard
2. Stables, HS 140
3. Blacksmith
4. Hospital, HS 139
5. Sutler's House, HS 135
6. Sutler's Store, HS 2
7. Arsenal/Magazine, HS 11
8. Officers' Quarters, HS 57
9. Old Bedlam, HS 1
10. Officers' Quarters, HS 57
11. Officers' Quarters, HS 58
12. Officers' Quarters, HS 59
13. Stable, HS 141
14. Officers' Quarters, HS 60
15. Band Room, HS 72
16. Barracks, HS 74
17. Kitchen, HS 76
18. Sink, HS 79
19. Sink, HS 119
20. Icehouse, HS 71
21. Guardhouse, HS 8
22. Barracks, HS 77
23. Barracks, HS 77
24. Kitchen, HS 78
25. Bakery, HS 49
26. Telegraph Office
27. Carpenter, HS 110
28. Lumber Yard
29. Commissary
30. Quartermaster
31. Laundress, HS 82
32. Teamsters, HS 96
33. Saddler, HS 104
34. Corral
35. Quartermaster's Storehouse, HS 113
36. Quartermaster's Storehouse, HS 113
37. Quartermaster's Storehouse
38. Blacksmith, HS 105

1863 TRANSFORMED UTM COORDINATES

Structure 1
 4672625,536785.2
 4672552,536863.9
 4672544,536850.1
 4672617,536772.1
 Structure 2
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 4672496,536760.3
 4672541,536709.6
 4672547,536719.4
 4672558,536707.6
 4672587,536750.1
 4672576,536761.5

| | | |
|------------------|------------------|------------------|
| Structure 3 | 4672256,536462.1 | 4672170,536643.1 |
| 4672472,536508.3 | 4672260,536465.6 | 4672168,536648.2 |
| 4672434,536560.6 | 4672256,536471.9 | 4672156,536638.6 |
| 4672411,536539.0 | 4672227,536449.1 | 4672158,536633.8 |
| 4672442,536495.4 | 4672211,536436.9 | Structure 23 |
| 4672449,536500.9 | 4672209,536439.6 | 4672204,536598.3 |
| 4672455,536492.6 | 4672139,536382.9 | 4672190,536614.8 |
| Structure 4 | 4672166,536340.0 | 4672181,536608.5 |
| 4672403,536627.4 | 4672249,536409.3 | 4672195,536591.9 |
| 4672387,536650.9 | 4672235,536436.6 | Structure 24 |
| 4672370,536637.0 | 4672249,536444.5 | 4672208,536602.4 |
| 4672364,536646.2 | Structure 12 | 4672195,536618.9 |
| 4672338,536624.0 | 4672197,536461.1 | 4672191,536616.4 |
| 4672362,536589.4 | 4672191,536467.6 | 4672205,536600.1 |
| 4672370,536614.5 | 4672183,536461.7 | Structure 25 |
| 4672362,536625.3 | 4672188,536454.4 | 4672244,536589.2 |
| 4672367,536630.1 | Structure 13 | 4672230,536606.4 |
| 4672360,536639.5 | 4672175,536442.2 | 4672226,536602.9 |
| 4672343,536624.8 | 4672169,536449.1 | 4672239,536585.4 |
| 4672350,536615.1 | 4672161,536442.6 | Structure 26 |
| 4672354,536617.9 | 4672166,536435.6 | 4672254,536597.6 |
| 4672361,536607.3 | Structure 14 | 4672247,536607.2 |
| Structure 5 | 4672152,536424.1 | 4672243,536604.9 |
| 4672327,536573.8 | 4672148,536430.7 | 4672251,536594.8 |
| 4672315,536592.6 | 4672139,536423.8 | Structure 27 |
| 4672294,536575.1 | 4672144,536417.5 | 4672273,536605.9 |
| 4672301,536562.6 | Structure 15 | 4672271,536608.5 |
| 4672275,536542.1 | 4672093,536462.4 | 4672266,536605.2 |
| 4672278,536538.9 | 4672080,536477.6 | 4672262,536602.9 |
| 4672302,536558.9 | 4672053,536453.4 | 4672266,536597.6 |
| 4672304,536555.4 | 4672067,536436.9 | 4672270,536600.3 |
| Structure 6 | 4672089,536456.8 | 4672268,536602.4 |
| 4672282,536523.3 | 4672088,536457.8 | Structure 28 |
| 4672279,536526.1 | Structure 16 | 4672242,536613.3 |
| 4672273,536520.3 | 4672011,536518.8 | 4672237,536618.9 |
| 4672275,536518.1 | 4672002,536531.8 | 4672234,536615.8 |
| Structure 7 | 4671995,536526.5 | 4672238,536610.5 |
| 4672261,536525.5 | 4672004,536513.3 | Structure 29 |
| 4672258,536530.5 | Structure 17 | 4672230,536627.3 |
| 4672254,536537.3 | 4672079,536572.3 | 4672220,536640.5 |
| 4672252,536542.1 | 4672076,536576.4 | 4672216,536637.4 |
| 4672245,536536.4 | 4672053,536558.9 | 4672226,536624.5 |
| 4672254,536520.3 | 4672056,536554.5 | Structure 30 |
| Structure 8 | Structure 18 | 4672224,536614.1 |
| 4672246,536525.8 | 4672070,536584.3 | 4672210,536630.8 |
| 4672241,536533.9 | 4672068,536587.9 | 4672206,536627.3 |
| 4672225,536520.3 | 4672044,536569.6 | 4672219,536610.8 |
| 4672229,536511.8 | 4672047,536566.3 | Structure 31 |
| Structure 9 | Structure 19 | 4672203,536686.6 |
| 4672224,536506.9 | 4672060,536599.3 | 4672199,536690.3 |
| 4672223,536509.5 | 4672057,536602.9 | 4672196,536685.3 |
| 4672217,536505.9 | 4672049,536596.4 | 4672200,536681.7 |
| 4672214,536511.8 | 4672052,536592.6 | Structure 32 |
| 4672191,536493.4 | Structure 20 | 4672214,536703.3 |
| 4672195,536487.4 | 4672114,536643.1 | 4672210,536707.4 |
| 4672190,536482.8 | 4672111,536647.3 | 4672203,536696.4 |
| 4672191,536480.1 | 4672101,536639.4 | 4672208,536692.4 |
| Structure 10 | 4672104,536635.0 | Structure 33 |
| 4672188,536483.8 | Structure 21 | 4672221,536725.4 |
| 4672186,536487.1 | 4672140,536649.3 | 4672215,536728.5 |
| 4672182,536484.8 | 4672138,536652.8 | 4672210,536715.0 |
| 4672185,536481.2 | 4672132,536647.8 | 4672216,536712.1 |
| Structure 11 | 4672134,536644.3 | Structure 34 |
| 4672260,536454.1 | Structure 22 | 4672228,536745.5 |

4672212,536753.7
 4672207,536740.7
 4672223,536731.9
 Structure 35
 4672236,536766.4
 4672220,536775.0
 4672215,536761.8
 4672231,536753.3
 Structure 36
 4672310,536696.9
 4672284,536710.8
 4672286,536714.6
 4672282,536716.9
 4672276,536701.8
 4672305,536685.5
 Structure 37
 4672282,536766.4
 4672275,536769.9
 4672262,536737.6
 4672268,536734.0
 Structure 38
 4672266,536774.5
 4672258,536779.3
 4672245,536746.8
 4672253,536742.1
 Structure 39
 4672245,536809.0
 4672241,536811.2
 4672235,536795.0
 4672239,536792.8
 Structure 40
 4672341,536849.6
 4672314,536864.8
 4672284,536792.3
 4672292,536788.5
 4672290,536784.1
 4672298,536779.8
 4672302,536787.6
 4672312,536782.6
 Structure 41
 4672293,536823.3
 4672288,536826.9
 4672275,536797.5
 4672281,536794.4
 Structure 42
 4672285,536828.2
 4672279,536831.6
 4672267,536802.8
 4672273,536798.8
 Structure 43
 4672310,536863.3
 4672303,536867.6
 4672290,536833.2
 4672297,536829.8
 Structure 44
 4672272,536885.6
 4672265,536889.7
 4672261,536880.6
 4672269,536876.0

1854 STRUCTURES, FIGURE A.4

1. Potato Field
2. Sutler's Store, HS 2
3. Sutler's Storehouse, HS 53

4. Magazine, HS 11
5. Officers' Quarters, HS 50
6. Old Bedlam, HS 1
7. Excavation
8. Excavation
9. Excavation
10. Officers' Quarters, HS 15
11. Officers' Quarters, HS 16
12. Officers' Quarters, HS 17
13. Proposed Officers' Quarters
14. Fort John, HS 18-21
15. Band Room
16. Barracks, HS 47
17. Commissary Storehouse, HS 40
18. Barracks, HS 45
19. Kitchens, HS 46
20. Bakery, HS 49
21. Post Garden
22. Hay Yard
23. Corn Yard
24. Commissary Quarters
25. QuarterMaster's Office
26. Laundress' Quarters, HS 35
27. Commissary Storehouse
28. Corn House, HS 41
29. Corn House, HS 42
30. Stable, HS 43

1854 TRANSFORMED UTM COORDINATES

Structure 1
 4672372,536574.4
 4672369,536578.9
 4672357,536569.9
 4672360,536564.9
 Structure 2
 4672366,536584.8
 4672362,536589.9
 4672348,536578.6
 4672351,536573.9
 Structure 3
 4672334,536576.1
 4672327,536585.8
 4672307,536570.4
 4672308,536567.7
 4672298,536559.2
 4672301,536554.9
 4672316,536566.6
 4672318,536564.4
 Structure 4
 4672307,536579.4
 4672302,536585.1
 4672286,536571.9
 4672293,536562.9
 4672303,536571.1
 4672302,536574.1
 Structure 5
 4672279,536510.8
 4672277,536512.8
 4672273,536509.1
 4672275,536506.9
 Structure 6
 4672269,536518.4
 4672265,536523.3

4672259,536518.4
 4672263,536513.3
 Structure 7
 4672245,536529.8
 4672241,536534.1
 4672224,536520.1
 4672227,536516.1
 Structure 8
 4672222,536501.3
 4672220,536504.3
 4672213,536499.2
 4672206,536508.9
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 4672199,536488.8
 4672192,536483.3
 4672195,536479.9
 Structure 9
 4672188,536488.2
 4672185,536491.7
 4672182,536488.9
 4672184,536485.2
 Structure 10
 4672197,536462.1
 4672194,536466.4
 4672188,536460.7
 4672191,536456.8
 Structure 11
 4672176,536445.0
 4672172,536448.9
 4672166,536443.3
 4672169,536439.8
 Structure 12
 4672155,536428.9
 4672152,536432.0
 4672145,536426.6
 4672148,536423.4
 Structure 13
 4672092,536461.3
 4672089,536466.4
 4672091,536468.8
 4672077,536488.4
 4672074,536485.8
 4672069,536491.8
 4672061,536485.5
 4672065,536479.3
 4672062,536476.1
 4672077,536457.2
 4672081,536459.8
 4672084,536455.8
 Structure 14
 4672078,536451.9
 4672044,536494.7
 4672013,536469.8
 4672047,536427.2
 Structure 15
 4672031,536521.6
 4672027,536525.8
 4672022,536522.0
 4672026,536517.8
 Structure 16
 4672107,536549.2
 4672101,536555.8
 4672054,536518.4
 4672059,536511.9



Figure A.4: UTM reference maps. Left = 1854. Right = 1851.

Structure 17
 4672162,536613.6
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 4672153,536617.5
 4672159,536610.8
 Structure 18
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 4672187,536606.9
 4672200,536591.4
 Structure 19
 4672225,536612.6
 4672212,536628.8
 4672208,536624.8
 4672220,536609.3
 Structure 20
 4672245,536589.9
 4672232,536604.8
 4672227,536599.9
 4672240,536585.6
 Structure 21
 4672263,536557.1
 4672259,536562.0
 4672255,536557.8
 4672258,536553.2
 Structure 22
 4672257,536569.3
 4672254,536572.3
 4672250,536568.1
 4672253,536565.3
 Structure 23
 4672271,536608.7
 4672269,536610.5
 4672268,536609.0
 4672265,536611.8
 4672259,536606.6
 4672263,536601.4
 4672270,536605.9
 Structure 24
 4672030,536679.6
 4672026,536684.6
 4672017,536676.4
 4672021,536671.6
 Structure 25
 4672161,536702.2
 4672159,536704.0
 4672154,536698.8
 4672155,536696.8
 Structure 26
 4672208,536699.2
 4672208,536703.6
 4672206,536706.1
 4672203,536707.9
 4672198,536697.6
 4672205,536693.3
 Structure 27
 4672219,536728.3
 4672214,536731.2
 4672209,536715.9
 4672213,536713.1
 Structure 28
 4672257,536725.8
 4672253,536727.9
 4672249,536719.6

4672252,536717.4
 Structure 29
 4672280,536733.0
 4672269,536738.9
 4672256,536708.3
 4672267,536701.9
 Structure 30
 4672285,536698.4
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 4672274,536699.8
 4672283,536694.9
 Structure 31
 4672288,536704.6
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 4672286,536701.4
 Structure 32
 4672291,536710.8
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 4672281,536712.4
 4672289,536707.3
 Structure 33
 4672337,536693.6
 4672332,536697.1
 4672335,536704.8
 4672342,536719.3
 4672330,536726.9
 4672324,536715.1
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 4672329,536691.9
 4672334,536688.8
 Structure 34
 4672345,536727.7
 4672337,536733.6
 4672335,536730.3
 4672344,536725.3
 Structure 35
 4672532,536820.0
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 4672351,536783.9
 4672357,536775.6
 4672338,536740.6
 4672339,536736.4
 4672348,536729.1
 4672427,536686.3
 4672450,536721.8
 4672466,536720.2
 Structure 36
 4672341,536761.4
 4672336,536765.1
 4672332,536756.3
 4672336,536752.1
 Structure 37
 4672370,536839.9
 4672360,536846.2
 4672344,536813.9
 4672354,536807.6
 Structure 38
 4672355,536849.0
 4672345,536855.9

4672329,536823.4
 4672339,536816.9
 Structure 39
 4672342,536858.5
 4672331,536865.4
 4672315,536832.4
 4672325,536826.4
 Structure 40
 4672390,536876.8
 4672379,536883.9
 4672362,536851.8
 4672373,536844.9
 Structure 41
 4672245,536804.5
 4672239,536807.8
 4672231,536785.5
 4672238,536782.4

1851 STRUCTURES, FIGURE A.4

1. Magazine, HS 11
2. Old Bedlam, HS 1
3. Officers' Quarters, HS 15
4. Officers' Quarters, HS 16
5. Officers' Quarters, HS 17
6. Storehouse, HS 53
7. Old Adobe Fort, HS 18-21
8. Stable, HS 22
9. Stable, HS 156
10. Barracks, HS 45
11. Sutler's Store, HS 2
12. Bakery, HS 49
13. Temporary Quarters for Q.M. Men
14. Workshops, HS 33
15. Blacksmith, HS 39
16. Storerooms, HS 40
17. Saw Mill, HS 166

1851 TRANSFORMED UTM COORDINATES

Structure 1
 4672305,536577.3
 4672298,536586.4
 4672288,536578.8
 4672296,536569.4
 Structure 2
 4672281,536608.6
 4672279,536611.8
 4672275,536608.8
 4672271,536605.6
 4672274,536601.7
 4672278,536605.3
 Structure 3
 4672268,536522.6
 4672264,536527.4
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 4672260,536516.1
 Structure 4
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 4672215,536504.1
 4672210,536510.4
 4672213,536513.6
 4672212,536516.1
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4672193,536496.6
4672196,536499.3
4672201,536493.1
4672195,536488.2
4672199,536483.6
Structure 5
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4672180,536474.8
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4672164,536478.3
4672174,536463.6
Structure₁6
4672163,536455.5
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4672144,536464.6
4672154,536449.7
Structure 7
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4672124,536450.2
4672135,536435.4
Structure 8
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4672066,536489.4
4672077,536475.4
Structure 9
4672078,536451.4
4672045,536494.6
4672014,536469.6
4672047,536426.8
Structure 10
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4672108,536566.2
4672055,536522.5
4672062,536513.8
Structure 11
4672171,536605.2
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4672122,536576.2
4672128,536569.6
Structure 12
4672209,536598.9
4672196,536614.7
4672188,536607.4
4672201,536592.2
Structure 13
4672198,536668.2
4672194,536672.6
4672186,536665.8
4672189,536661.4
Structure 14
4672316,536716.6
4672311,536719.3
4672303,536700.1
4672308,536697.9
Structure 15
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Structure 16
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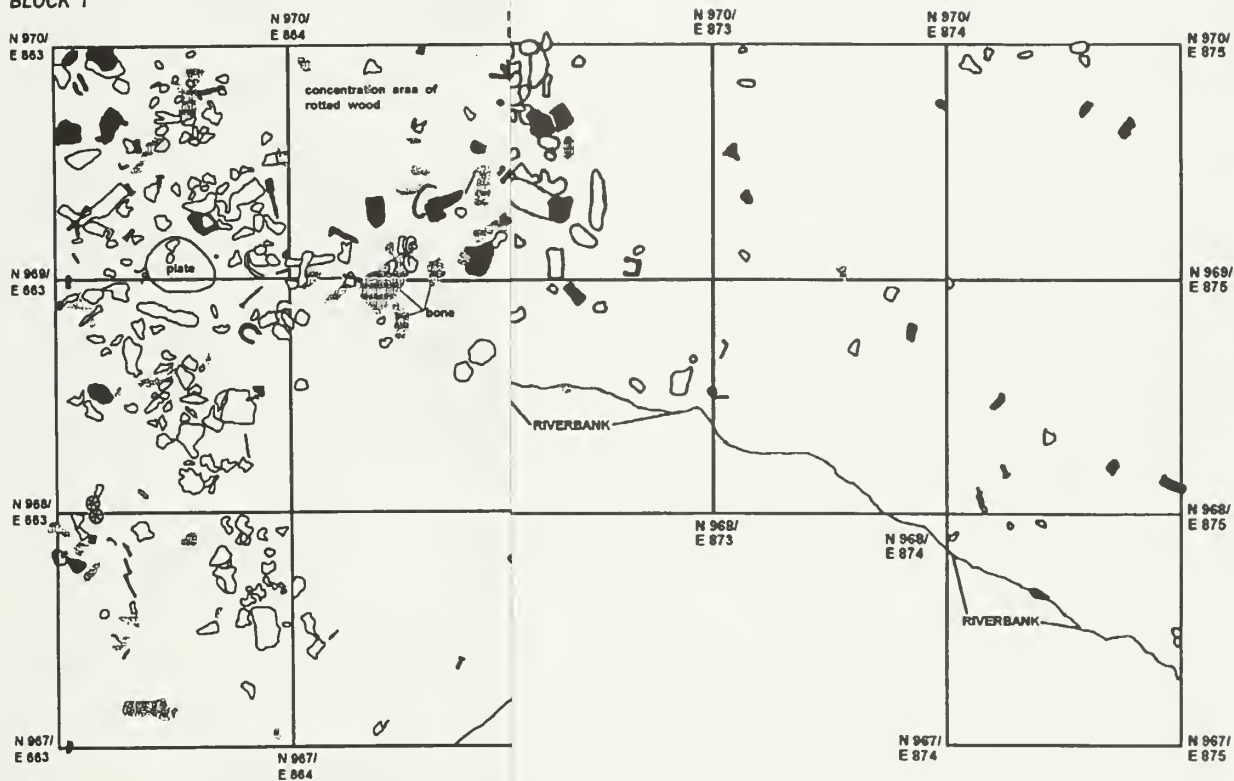
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Structure 17
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4672251,536717.9
Structure 18
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4672244,536803.8
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4672235,536793.3
4672232,536785.1
4672240,536782.4

APPENDIX TWO

FORT LARAMIE NATIONAL HISTORIC SITE, QUARTERMASTER DUMP PROJECT, EXCAVATION BLOCKS ONE, TWO, THREE, AND FOUR, ARTIFACT DISTRIBUTION MAPS

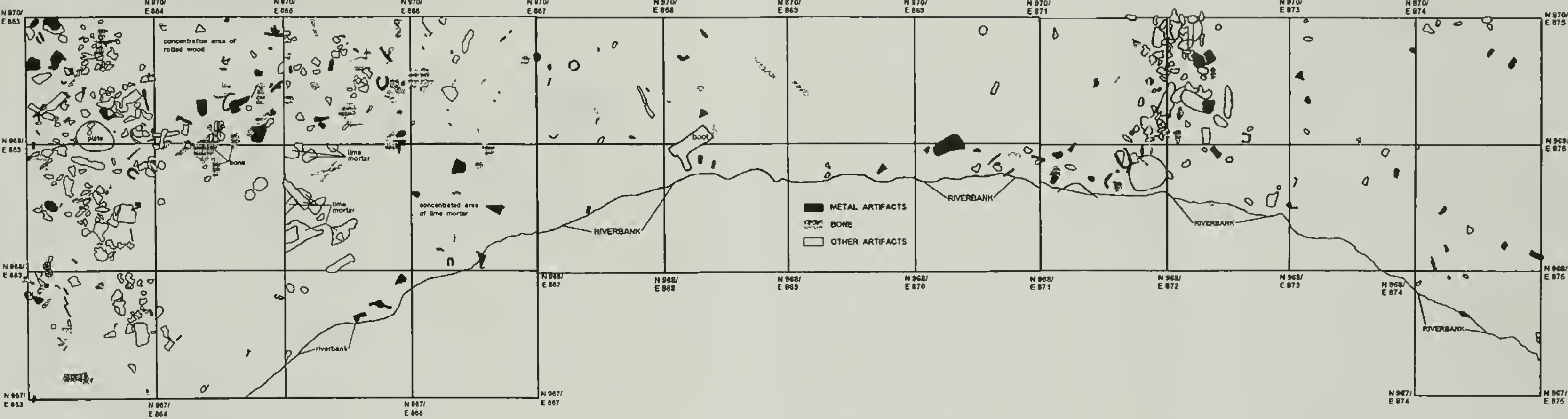
MAP 1

FORT LARAMIE NATIONAL H 1994 QUARTERMASTER DUMP PROJECT BLOCK 1

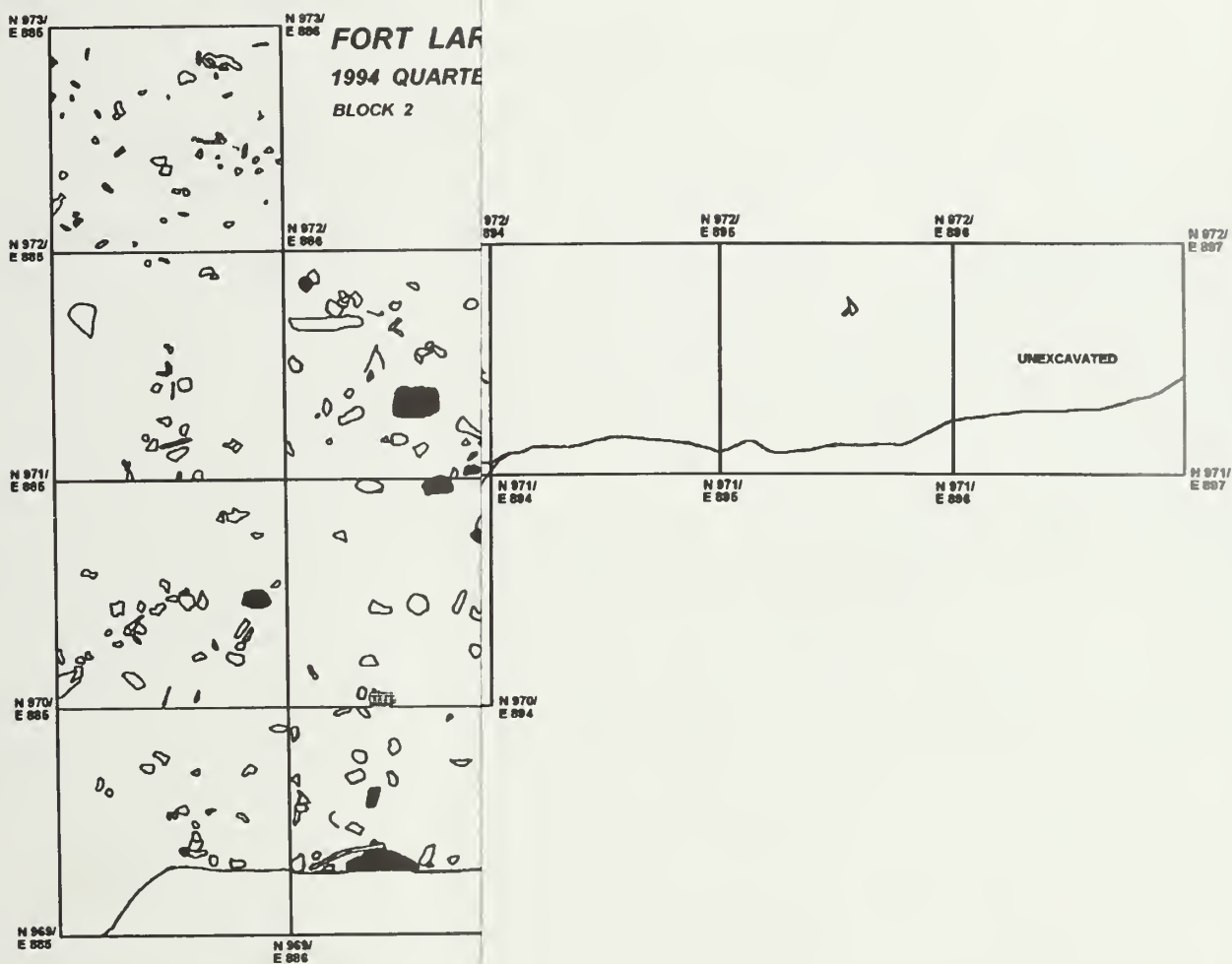


MAP 1

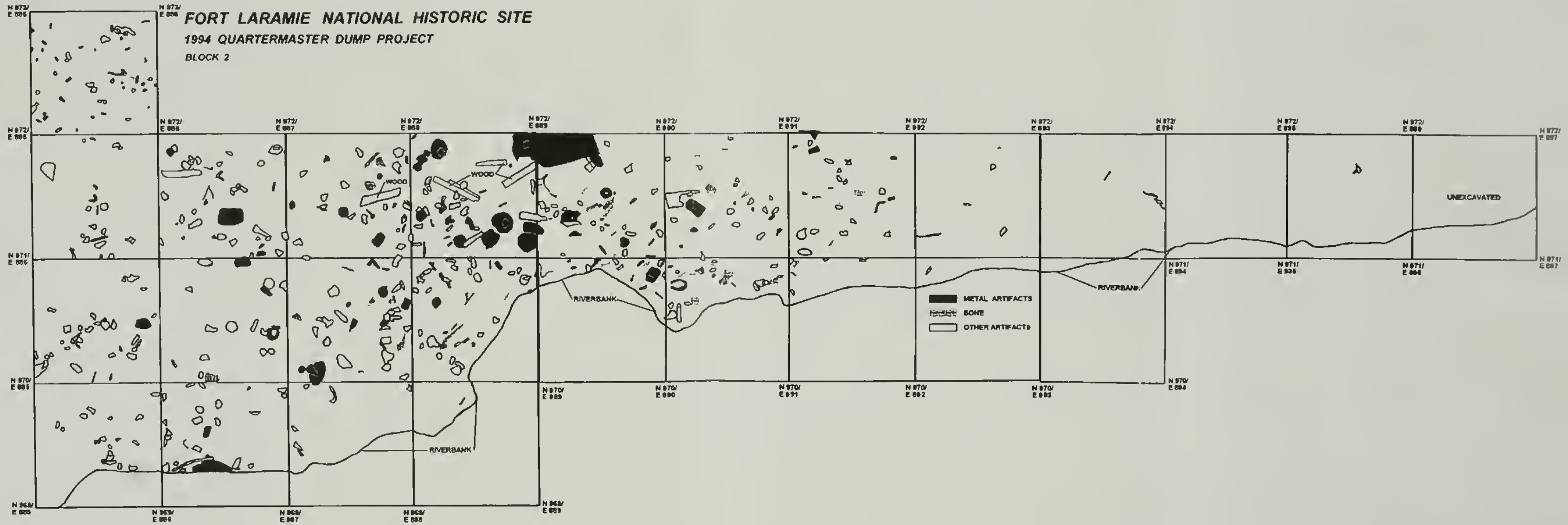
FORT LARAMIE NATIONAL HISTORICAL SITE 1994 QUARTERMASTER DUMP PROJECT BLOCK 1



MAP 2



MAP 2

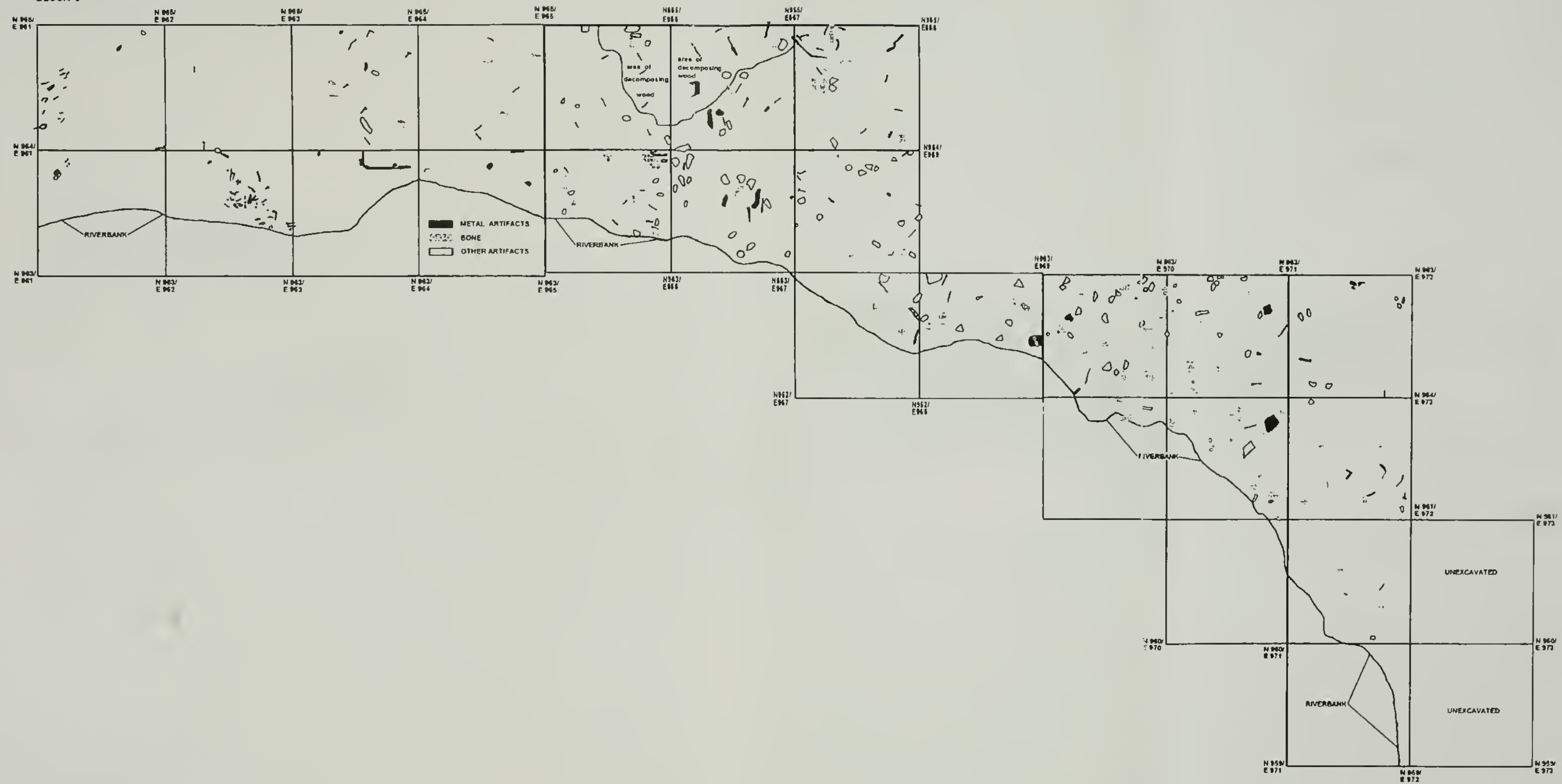


MAP 3

FORT LARAMIE NATIONAL H
1994 QUARTERMASTER DUMP PROJECT
BLOCK 3

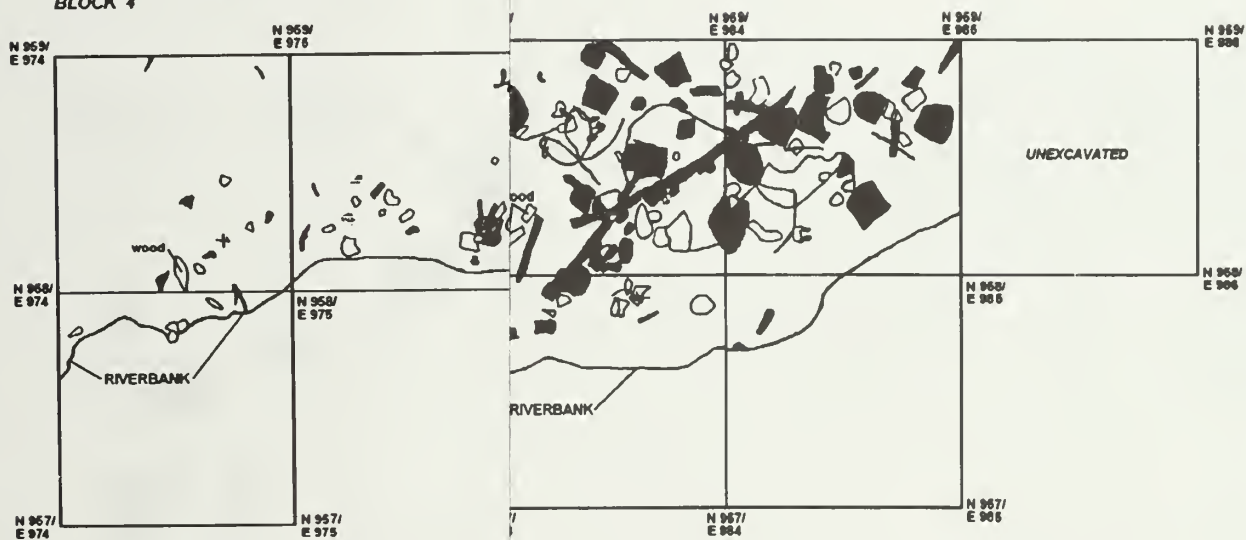


MAP 3
FORT LARAMIE NATIONAL HISTORIC SITE
1994 QUARTERMASTER DUMP PROJECT
BLOCK 3



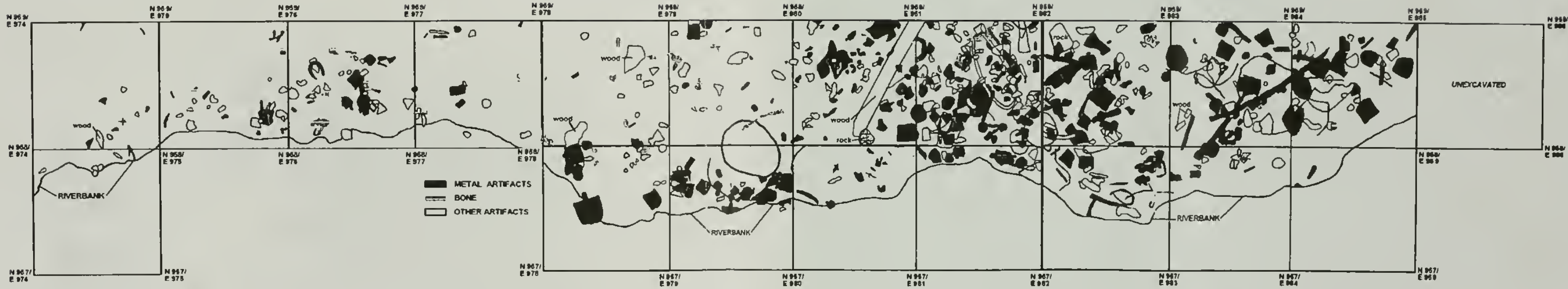
MAP 4

FORT LARAMIE NATIONAL HISTORIC SITE
1994 QUARTERMASTER DUMP PROJECT
BLOCK 4



MAP 4

FORT LARAMIE NATIONAL HISTORIC SITE
1994 QUARTERMASTER DUMP PROJECT
BLOCK 4

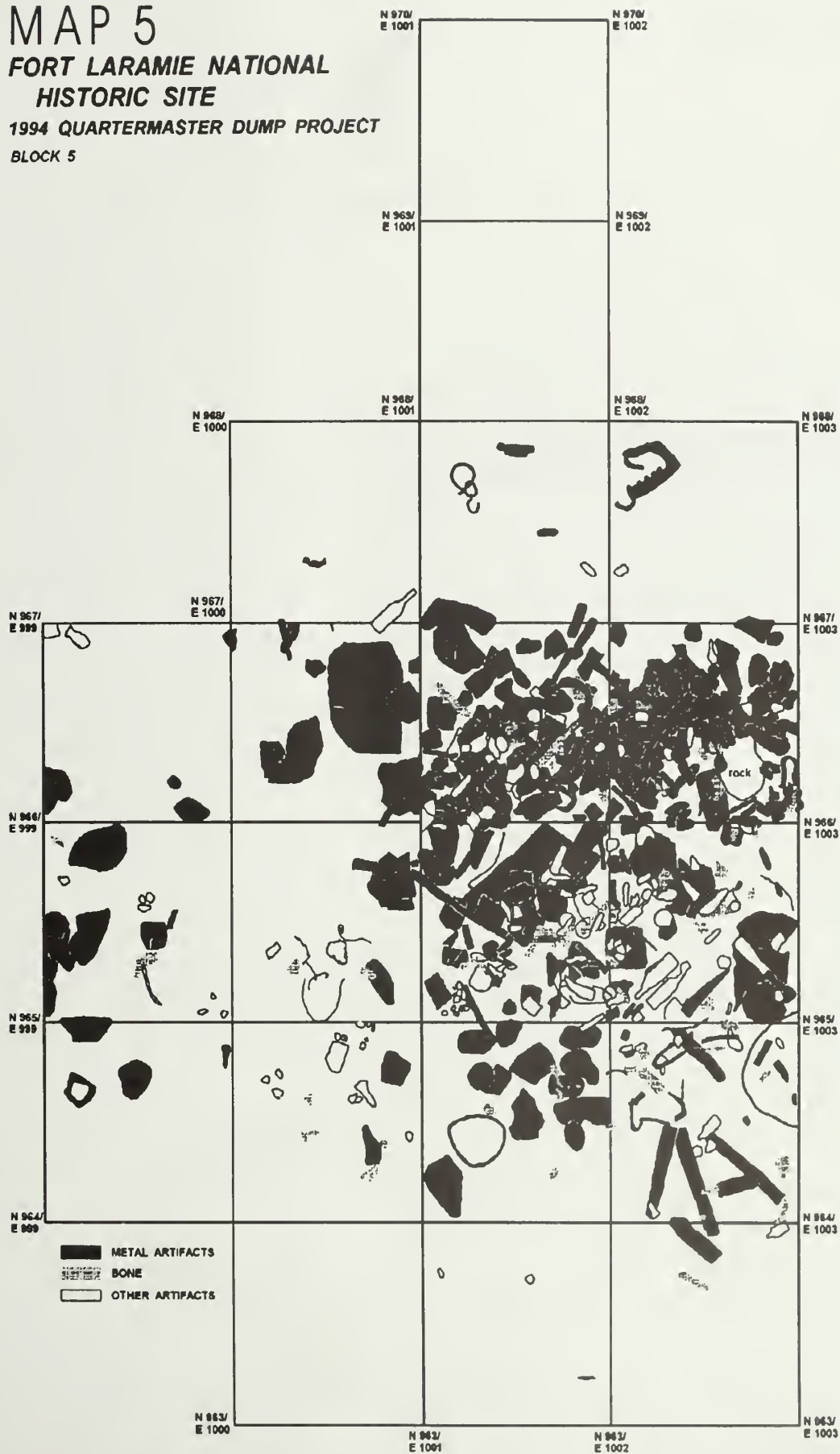


MAP 5

FORT LARAMIE NATIONAL HISTORIC SITE

1994 QUARTERMASTER DUMP PROJECT

BLOCK 5





SELECTIONS from the DIVISION OF CULTURAL RESOURCES
Rocky Mountain Region, National Park Service

- No. 1. **Cultural Resource Inventory and Testing in the Salt Creek Pocket and Devils Lane Areas, Needles District, Canyonlands National Park, Utah** by Betsy L. Tipps and Nancy J. Hewitt; 1989.
- No. 2. **Gateways to Commerce: The U.S. Army Corps of Engineers' 9-Foot Channel Project on the Upper Mississippi River** by William Patrick O'Brien, Mary Yeater Rathbun, and Patrick O'Bannon; 1992.
- No. 3. **The Archaeology of Beaver Creek Shelter (39CU779): A Preliminary Statement** by Lynn Marie Alex; 1991.
- No. 4. **Archaeological Investigations at Two Sites in Dinosaur National Monument: 42UN1724 and 5MF2645** by James A. Truesdale; 1993.
- No. 5. **The History of the Construction of the Road System in Yellowstone National Park, 1972-1966. Historic Resource Study Volume I** by Mary Culpin; 1994.
- No. 6. **Indian Cliff Plateau Prehistoric Lithic Source, Yellowstone National Park, Wyoming** by Leslie B. Davis, Stephen A. Aaberg, and James G. Schmitt; 1995.
- No. 7. **Holocene Archaeology near Squaw Butte, Canyonlands National Park, Utah** by Betsy L. Tipps; 1995.

CULTURAL RESOURCES SELECTIONS
Intermountain Region, National Park Service

- No. 8. **Cultural Landscape Report: Fruita Rural Historic District, Capitol Reef National Park** by Cathy A. Gilbert and Kathleen L. McKoy; 1997
- No. 9. **Ethnographic Overview and Assessment of Devils Tower National Monument** by Jeffry R. Hanson and Sally Chirinos; 1997
- No. 10. **A Classic Western Quarrel: A History of the Road Controversy at Colorado National Monument** by Lisa Schoch-Roberts; 1997
- No. 11. **Cultural Resource Investigations Near White Crack, Island-in-the Sky District, Canyonlands National Park, Utah** by Betsy L. Tipps, Andre D. La Fond, and Robert I. Birnie; 1998
- No. 12. **Barrier to Crossroads: An Administrative History of Capitol Reef National Park** by Bradford Frye; 1998
- No. 13. **Archeology at the Fort Laramie Quartermaster Dump Area, 1994-1996**, edited by Danny N. Walker; 1998.

